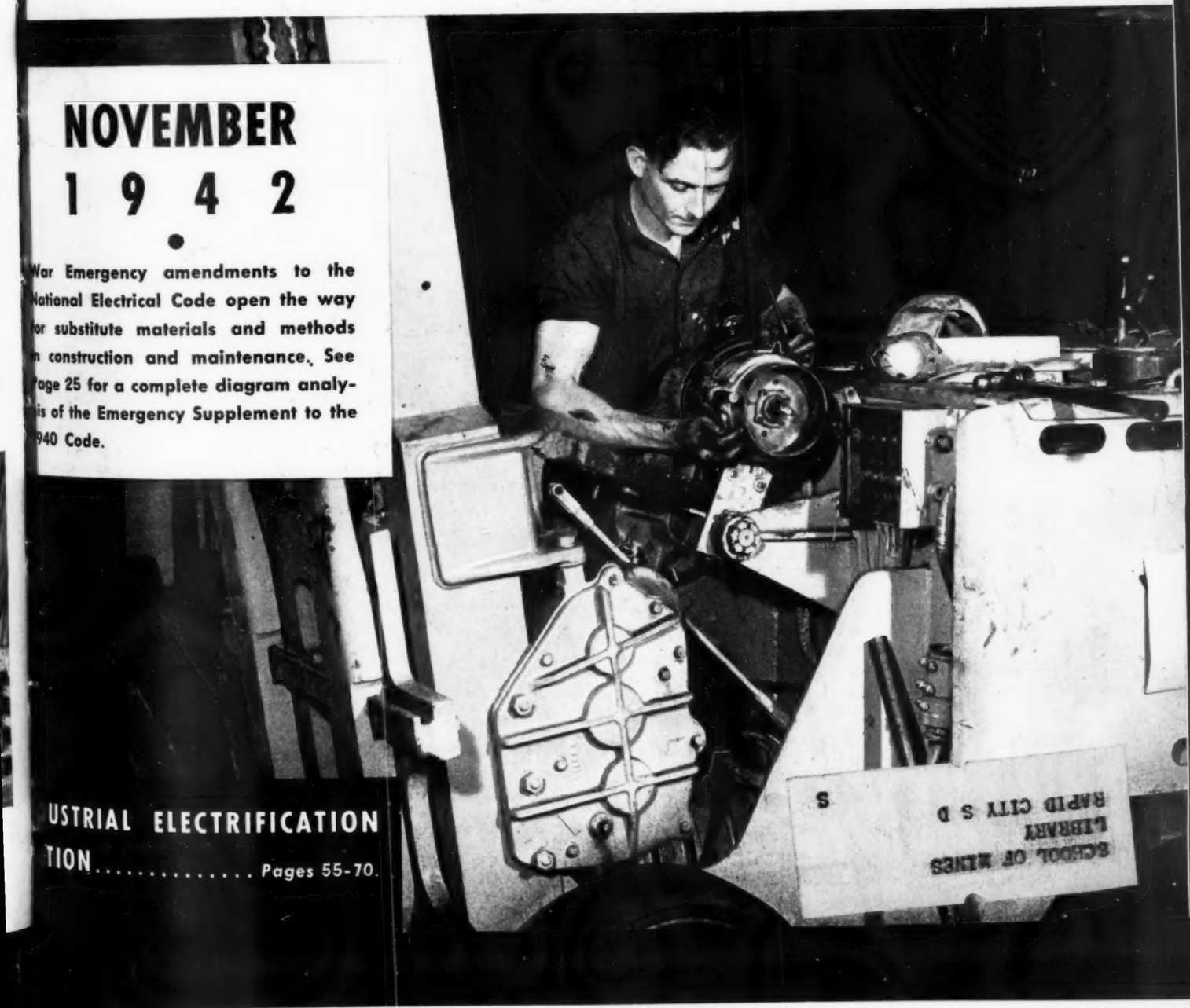
Electrical Contracting



NOVEMBER
1942

War Emergency amendments to the National Electrical Code open the way for substitute materials and methods in construction and maintenance. See Page 25 for a complete diagram analysis of the Emergency Supplement to the 1940 Code.

Which OF THESE HANDY INSTRUMENTS DO YOU LACK?

Type AK-1 Hook-on Volt-ammeter (A-C) Here's the handiest type of instrument for quick load checks. Forget about cutting conductors or interrupting service. Just hook it around the line, flick the selector switch to AMPERES, and you have your measurement. It measures volts also—connect the voltage leads, snap the switch to VOLTS, and take your reading. Accuracy, ±3 per cent. (Bulletin GEA-2950.)

Type AP-9, Medium-size A-C Portables—and Type DP-9, D-C You'll want this instrument for jobs requiring a high degree of accuracy—it's accurate within ¾ of one per cent. It is very portable—size only 2½ by 6½ by 4¾ inches. Available in a-c ammeters, voltmeters, milliammeters, and wattmeters; and d-c ammeters, voltmeters, milliammeters, microammeters, and millivoltmeters. (Bulletin GEA-1784.)

Type AS-5, Pocket-size A-C Portables—and Type DS-5, D-C This one fits easily in a coat pocket (size, 2 by 3½ by 5½ inches), yet it is accurate within one per cent. Available in a-c ammeters voltmeters, and milliammeters; and d-c ammeters, voltmeters, milliammeters, microammeters, and millivoltmeters. (Bulletin GEA-1784.)

Type CF, Inkless Recorders (Portable) Often, a chart record of load or voltage conditions over a period of time is needed to study the duration of peaks and the time when they occur. The CF line is ideal for this purpose. They're *inkless*—ready to go at a moment's notice—no pen to start, no inkwell to fill, and no ink to spill and blur the record. They weigh only 12 pounds. They are very accurate—a-c voltmeters, within 1½ per cent; ammeters, within 2 per cent. Available in a-c ammeters and voltmeters; and d-c ammeters, voltmeters, milliammeters, microammeters, and millivoltmeters. (Bulletin GEA-3187.)

New Low Chart Speed You can now get a 30-day record on a 30-inch chart—with our new one-inch-per-day chart speed. This simplifies survey analysis. Speeds of 1, 2, and 3 inches per hour can be obtained for applications requiring a higher chart speed.

Type CD, Ink Recorders (Portable and Switchboard Types) These recorders are ideal for those applications where a high degree of accuracy is very important. Either ink type or inkless. They are available in a-c ammeters, voltmeters, wattmeters, power-factor meters, and frequency meters; and in d-c ammeters, voltmeters, milliammeters, millivoltmeters, and wattmeters. (Bulletin GEA-1061.)

Current-measuring Sets (A-C) Any of the above ammeters can be supplied equipped with a split-core current transformer—the AK-1 has the transformer built in. Thus you can obtain the "hook-on" advantages in these other instruments, too, for load measurements.

These are but a few of the many instruments General Electric can furnish to measure any electrical quantity. If you want information about other instruments, we'll be glad to supply it. Ask the nearest G-E office, or write to General Electric Company, Schenectady, N. Y.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

692-40-6200

ELECTRICAL CONTRACTING. Published monthly, price 25 cents a copy, Vol. 41, No. 11. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, Electrical Contracting, 330 West 42nd Street, New York, N. Y. Subscription Rates —U. S. A., and Latin-American Republics, $2.00 a year, $3.00 for two years, $4.00 for three years. Canada $2.50 a year, $4.00 for two years, $5.00 for three years. Great Britain and British Possessions 18 shillings for one year, 36 shillings for three years. All other countries $3.00 a year; $6.00 for three years. Entered as second-class matter August 29, 1936, at Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. Cable address: "McGrawhill, New York." Member A. B. P. Member A. B. C.

Here's Why This New Removable Breaker Is So Easy to Inspect

JUST loosen two screwbolts—and the complete breaker can be pivoted outward and lifted free, ready for inspection. It is just as easily replaced.

Simple? Yes—simple and easy to a degree which invites regular inspection. This discourages long-time neglect and avoids shutdowns, which are more costly today than ever before.

Plant engineers call it the 3-minute breaker. With it, you can reestablish service after temporary faults in less than one minute; inspect the breaker in safety, away from live parts—in less than two minutes; and where load conditions have changed, you can interchange breaker units in less than three minutes.

Give your production, equipment, and personnel complete protection. Install these breakers in lighting, power, and motor circuits—up to 600 volts. They will protect both the circuit wiring and the apparatus connected to the circuit. A new illustrated booklet (GEA-3600) tells where and how to use them. Ask the nearest G-E office for a copy, or address General Electric Company, Schenectady, N. Y.

THE BREAKER WITH THE DISCONNECT FEATURE

GENERAL ELECTRIC

860-22

Q-FLOORS MEET WARTIME CHANGES QUICKLY

In a matter of minutes, when War demands "change", desks can be moved, office equipment and lights can be moved to meet the need for new and more efficient layouts . . . *in a Q-Floored office building.*

In an unbelievably short time, machinery and plant equipment can be moved and electrically powered, to meet the production demands of war . . . *in a Q-Floored factory building.*

In such a time as this, when the capacity for quick rearrangement of office and plant equipment is so vitally urgent, a Q-Floor is indeed an ally of war. This "Quick-change" floor has a complete built-in system of electrical distribution . . . provides wiring raceways that are easily accessible over the entire floor area.

Greater profit for the electrical contractor is another Q-Floor advantage. Q-Floors cut down overhead by keeping crews on the job continuously. There is no reduction in productive labor and materials.

H. H. ROBERTSON COMPANY
FARMERS BANK BUILDING • PITTSBURGH, PA.

G-E Announces

ROBERTSON

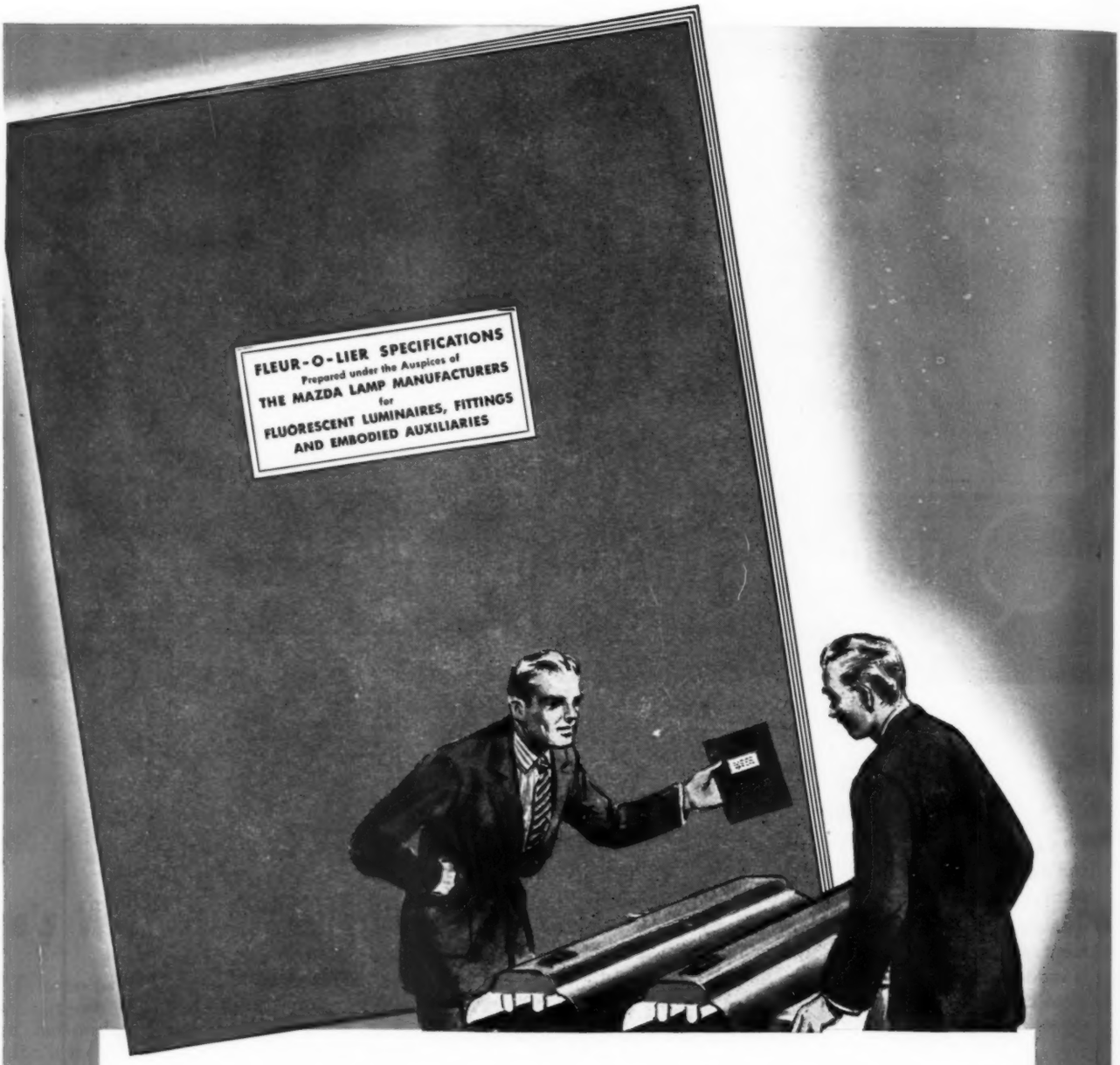
Q-FLOOR

ELECTRICAL FITTINGS

For information about these fittings and how they are used to obtain adequate up-to-date electrical wiring—get in touch with your nearest G-E Merchandise Distributor.

ROBERTSON Q-FLOORS

To answer the Questions of men who



These manufacturing specifications for Certified FLEUR-O-LIER fixtures have been written to protect those who *specify* and those who use fluorescent lighting. Skilled lighting engineers of the MAZDA Lamp manufacturers put their full knowledge into the setting up of these standards—to assure you of highly satisfactory service from fixtures and efficient performance from lamps. *Get a copy* for your files!*

purchase lighting equipment for war work...

these facts about Fleur-O-Liers should be in your files!

No specifications are more complete. They cover not only reflectors but auxiliaries (ballasts and starters) as well—a full check on electrical, mechanical and lighting performance.

This information takes you "behind the scenes." It gives you full details of how fixtures built to these specifications are tested and checked by Electrical Testing Laboratories, Inc., of New York—before these impartial experts issue the right to use the famous FLEUR-O-LIER Certification Label. Over 40 leading fixture manufacturers are already making fixtures to these standards and participation in the program is open to *any* manufacturer who complies with the FLEUR-O-LIER requirements.

Plant engineers, architects, purchasing departments can have the full assurance that fixtures bearing the FLEUR-O-LIER label have been *Certified* by Electrical Testing Laboratories as meeting all of these specifications—making unnecessary any further test or check by the user.

★ *A request on your business letterhead will bring the actual fixture specifications to you promptly. Write NOW to FLEUR-O-LIER Manufacturers, 2122-11 Keith Bldg., Cleveland, O.*

Here are a few of the rigid Specifications to which Certified Fleur-O-Liers are built

- **MAXIMUM LIGHT OUTPUT** . . . Certified control equipment plus high reflection factor assures efficient light from the lamps.
- **BRIGHTNESS** . . . Fixtures must conform to definite shielding standards so that high brightness will not be in the normal line of vision.
- **FLICKER CORRECTION** . . . on circuits of two lamps or more. For less eyestrain . . . greater safety.
- **CORRECT VENTILATION** . . . No danger of overheating in control unit. Assures more light from lamps.
- **SAFETY** . . . Fixture must withstand voltage test of 2,000 volts; electrical leakage must not exceed 0.2 milliampere.
- **HIGH POWER FACTOR** . . . The equipment used in the construction of the Fleur-O-Lier unit must provide a power factor of 85% or above (lagging). Means full use of wiring circuit.

To aid in the conservation of materials
Specifications now cover the use of alternate materials (non-ferrous reflectors).

FLEUR-O-LIERS

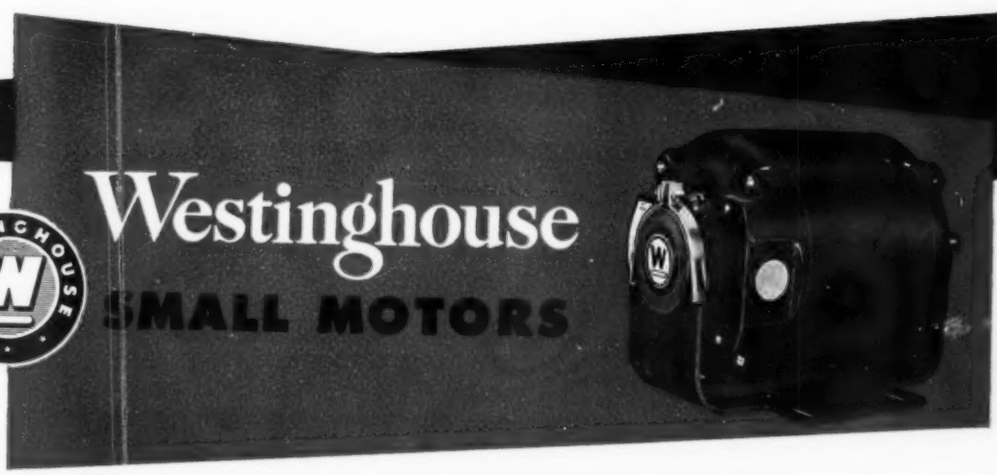
CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

SOME HOMELY TRUTHS ABOUT HARNESS and HORSEPOWER

HORSES ARE CAREFULLY HARNESSED  FOR THE WORK THEY DO. THE HARNESS USED DEPENDS ON THE WORK TO BE DONE... FOR INSTANCE, SADDLES FOR RIDING  ... COLLARS AND HEAVY TRACES FOR HAULING  ...LIGHT BREASTBANDS FOR DRIVING  ... ELECTRICAL HORSEPOWER,  TOO, MUST BE HARNESSED PROPERLY... THAT'S WHY WESTINGHOUSE SMALL MOTORS ARE DESIGNED  WITH DIFFERENT MOUNTINGS... IN ADDITION TO THE RIGID-BASE TYPE, THESE HUSKY FRACTIONAL HORSEPOWER MOTORS  ARE AVAILABLE WITH RESILIENT MOUNTINGS TO CUSHION  NOISE AND VIBRATION... THEY ARE ALSO AVAILABLE WITH AUTOMATIC BELT-TIGHTENING  BASES... THERE'S ALSO A FOOTLESS TYPE  FOR END MOUNTING, AND MOTORS WITH EITHER RIGID  OR RESILIENT  FLANGE MOUNTINGS... WHETHER YOU NEED THE POWER OF A PONY  OR A PERCHERON,  YOU CAN SELECT THE MOTOR YOU NEED WITH MADE-TO-MEASURE HARNESS  FROM THE STANDARD WESTINGHOUSE LINE  OF SMALL MOTORS.

J-03174



WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PENNSYLVANIA

"This is only the first lap . . .

. . . the first lap of a race to produce enough war material to destroy our enemies before they destroy us. Until the race is won, our job is to keep turning out more and more electrical cables for the war effort. It is the job for which we are best equipped. And we're making every minute count."

Employees of Hazard Insulated Wire Works

The Army-Navy "E" pennant we proudly fly tells the world that our plants are running day and night to meet the demands of our armed forces for insulated wires and cables. It means, too, that we cannot always fulfill the needs of our other customers on time — yet we are doing everything in our power to help them. But winning the war *must* come first.

3145

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE COMPANY

Wilkes-Barre, Pennsylvania — Offices in Principal Cities

BUY U. S. WAR BONDS — Every Payday All Hazard Employees BUY U. S. WAR BONDS

SPERO

DUR-O-LITE

Non-metallic Reflector Saves Critical Material

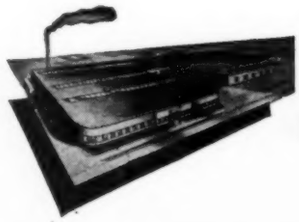
Designed for war plant use to provide up-to-the-minute fluorescent lighting in spite of steel shortage SPERO DUR-O-LITE Reflectors are now available for two 40-watt or 100-watt tubes and for three 40-watt tubes. All wiring and auxiliaries are mounted in steel raceway above reflector. Reflector is shaped to accord with Bureau of Standards design, finished in long lasting white enamel with high reflection factor, easily removable for cleaning.

DUR-O-LITE may be had as above with standard ballast and starters. DUR-O-LITE PLUS INSTA-LITE gives you the most advanced and efficient fluorescent lighting. INSTA-LITE combines the functions of the ballast and starter, thus eliminating the usual starting switch and with it, the largest part of fluorescent maintenance cost.

With NEW INSTA-LITE
gives you Instant Starting and Instant Lighting with NO starting switch

INSTA-LITE gives you Instant Starting . . . Lower Temperature Starting . . . Maximum Lumen Output . . . Low Power Losses . . . High Power Factor (90% or over) . . . With No Flicker . . . No Radio Interference . . . and Minimized Stroboscopic.

Cash-in on the sale of INSTA-LITE. Wire, phone or write for details on SPERO units that meet and anticipate today's demands. Distributed only through electrical wholesalers.



...5 LINES of Products from one dependable source

THE SPERO ELECTRIC CORPORATION
18222 LANKEN AVE. ★ CLEVELAND, OHIO

BUILD *Safety* INTO INDUSTRIAL JOBS!

APPLETON DEAD-END RECEPTACLES PROTECT PLANT AND OPERATOR

Type "QEE" Heavy Duty Receptacle With Threaded Housing and Type "CP" Dead-End Plug

Type "BRC" Extension Cable Connector

Type "BP" Plug For Flexible Cable

Type "BRF" Fused Plug For Portable Tools — Bakelite Housing

Type "BRP" Plug For Use With Dead-End Receptacles

General-Purpose, Explosion-Proof, Dust-Tight— the COMPLETE Line Answers Every Requirement

Electrical circuits in industrial plants, these days, must function smoothly and *safely* to give their best for war production.

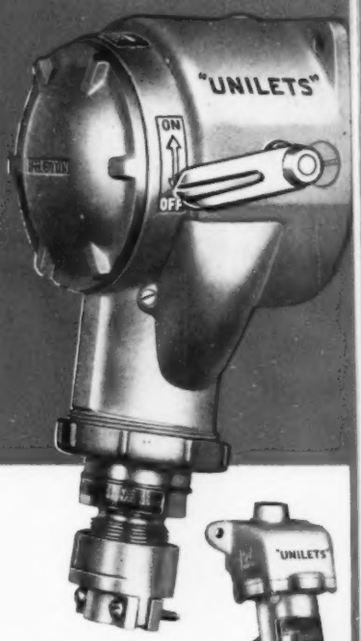
Appleton Dead-End Receptacles offer complete protection to the operator of plug-in equipment. No live parts are exposed. The connection can not be made until the plug has been *turned and fully seated!* The plug can not be pulled until *after* the connection is broken.

Even in general-purpose, non-explosion-proof types, arcs are confined to the combustion chamber where they can't start fires or cause personal injury.

The COMPLETE Appleton line includes dead-end receptacles and plugs for every kind of installation— general-purpose, dust-tight, explosion proof. Whatever your war construction requirements, you'll find exactly what you need in the Appleton Catalog No. 11, Sections 7 and 12.

Specify APPLETON fittings — they're "STANDARD FOR BETTER WIRING!"

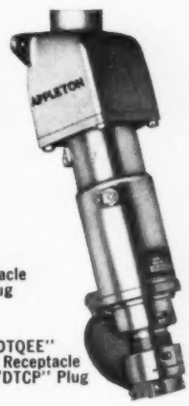
Sold Through Wholesalers



Type "FSQX" Explosion-Proof, Dust-Tight Receptacle With Safety Switch —Type "FP" Plug

Type "CPSIA" Explosion-Proof Receptacle With Type "CPP" Plug

Type "CEST" Explosion-Proof Receptacle With Type "CPH" Plug



Type "DTQEE" Dust-Tight Receptacle With Type "DTCP" Plug

SPECIAL FIGHTING EQUIPMENT

Appleton engineers are cooperating with the armed services in developing electrical plugs, receptacles and connectors for special war use. If you have need—or hear of the need—for such equipment, Appleton experience and skill are at your command.

APPLETON ELECTRIC COMPANY
1704 WELLINGTON AVENUE CHICAGO, ILLINOIS
Branch Offices: NEW YORK, 76 Ninth Avenue • DETROIT, 7310 Woodward Avenue • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 203 Luckie Street, N. W. • BIRMINGHAM, 6 N. Twenty-First Street • MINNEAPOLIS, 305 Fifth Street, S. • PITTSBURGH, 438 Bessemer Bldg.

Resident Representatives: Baltimore, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Seattle.

APPLETON ELECTRIC PRODUCTS

The name "Appleton," the registered trade-mark, "Unilets," or the famous circle-A Appleton trade-mark shown above, appears on every Appleton fitting. *We manufacture no private brand goods.*

APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

IMPROVED

Skilled hands depend almost entirely on eyes for guidance. That's why hands work faster and produce more with greater accuracy and safety when quality lamps make seeing easier. To make sure you get the utmost in lamp economy — brightness, long life, low cost—look for the "Westinghouse Mazda" trade mark on the lamps you buy.

It's WESTINGHOUSE *for better light at lower cost*

in all 3!

1. Brightness

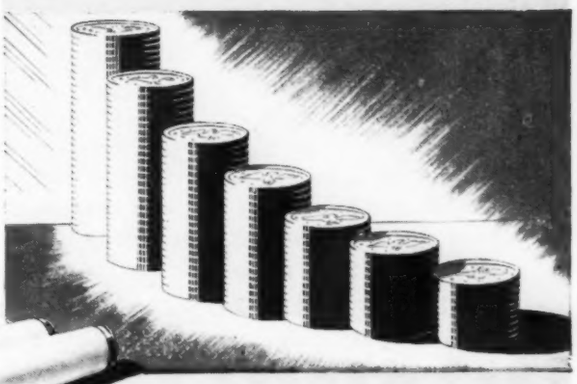
Through intensive research ever since fluorescent lamps were first introduced, Westinghouse has increased lamp brightness. This more-light-for-your-money advantage has been accomplished in many ways, for example: by making fluorescent powders which glow more brilliantly; by rigidly controlling thickness of the powder coating; by making lamps stay bright from end to end.

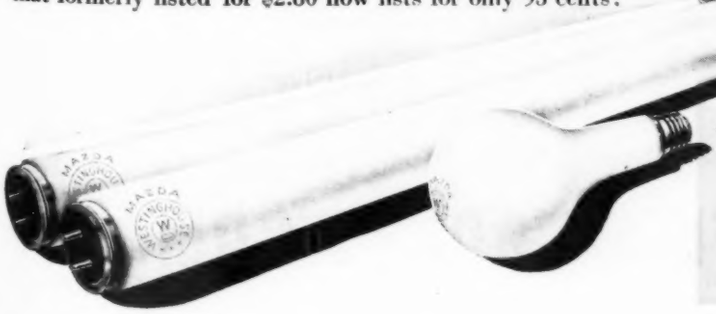
2. Long Life

Today's Westinghouse Mazda Fluorescent Lamps have a rated average of 2500 hours, or 1000 hours longer than the fluorescent lamps of four years ago. Westinghouse research achieved this advantage by many new developments, including improved electrode design; better control of gas pressure inside the lamp; and by perfecting the method and machines which insert the mercury into the lamp.

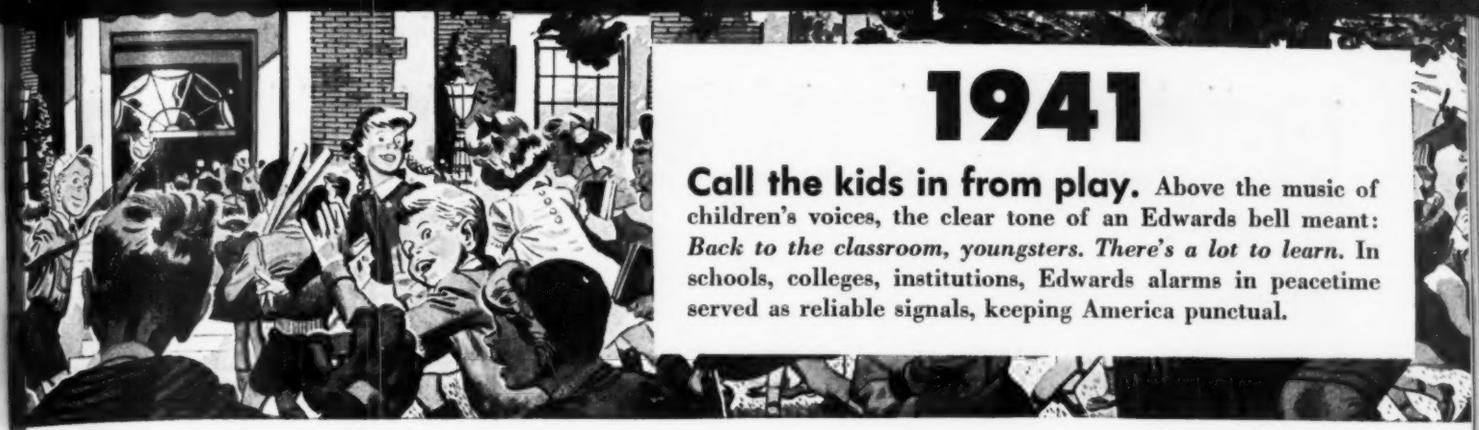
3. Low Cost

While many Westinghouse technicians were improving lamp quality, others were developing highly accurate mass production machinery to reduce lamp prices. As a result, Westinghouse Mazda Fluorescent Lamps are precision built to the most exacting limits, and now sell at the lowest prices in history. A 40-Watt Westinghouse lamp that formerly listed for $2.80 now lists for only 95 cents!





Westinghouse
MAZDA LAMPS



1941

Call the kids in from play. Above the music of children's voices, the clear tone of an Edwards bell meant: *Back to the classroom, youngsters. There's a lot to learn.* In schools, colleges, institutions, Edwards alarms in peacetime served as reliable signals, keeping America punctual.

Sound the alarm for battle stations!

• Sub sighted! The man on the bridge throws a switch. The sharp command of the alarm whips the deck to a fever of activity. Speed counts . . . *give that U-boat a bellyful.* Today, Edwards is on 24-hour war duty. America's *Liberty* ships are equipped with Edwards alarm systems; bells, annunciators, contact makers . . . safeguarding precious cargoes and lives. Multiply this story a hundredfold . . . on subchasers, destroyers, aircraft carriers, on bombers, PT boats, . . . wherever sure-fire electrical signaling is needed.

194? . . . Today's production at Edwards is at fever pitch for war . . . but research for tomorrow goes steadily on to assure distributors the best in peacetime signaling for the contractors and industrials who will reconstruct a war-torn world.

EDWARDS AND COMPANY, NORWALK, CONN.

EDWARDS

SPECIALISTS IN
ELECTRICAL SIGNALING
SINCE 1872

POLARIZED PLUGS and RECEPTACLES

ARROW

Products to help energize War-production plants

Give more power to MAN-power through more *Outlets* for portable tools. Add to flexibility of plant-equipment with additional power connections for light machines . . . Here's a way for the Electrical Contractor to extend production facilities, — to "energize" manufacturing operations *or* plant-conversion jobs.

ARROW provides many popular types of Polarized Receptacles and Plugs, built for rough handling in war-driven manufacturing. Two, three and four-wire Receptacles, Plugs and Connectors in 10, 20, 30 and 50 Ampere capacity. Above-shown are a few representatives of our *complete line* for Industry's current needs.

SOLD THROUGH YOUR ELECTRICAL WHOLESALER

ARROW ELECTRIC DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

Electrical Contracting

With which is consolidated The Electragist and Electrical Record . . . ESTABLISHED 1901

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A practical paper for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction and maintenance.

Contents for NOVEMBER, 1942

Departments

CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York, N. Y.

Director of Circulation:
Please change my address on Electrical Contracting

From .....

.....

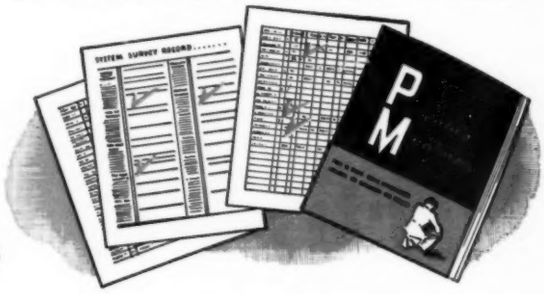
To .....

.....

Signed .....

How to stop production losses through Anaconda's PREVENTIVE MAINTENANCE Plan

1 **Send for this plan designed to prevent electrical system failures before they develop.**



With raw materials so critical—copper and rubber especially—Anaconda has developed a plan to help industry protect its electrical systems and at the same time, conserve critical materials. It is a practical, simplified manual prepared to meet wartime conditions.

2 **Use this plan periodically to check your electrical system for imminent failure.**

Manual includes special charts for analyzing your plant's electrical system, and for keeping a running check on its condition. Automatically uncovers danger spots . . . suggests a practical remedy for potential weaknesses.

3 **If the plan uncovers any critical complications, consult with Anaconda engineers.**

On critical problems, we offer the services of our engineering department and field service staff without cost.

NOTE: The Preventive Maintenance Plan will aid your local W.P.B. Branch in making its decision on your request for material required to avert an actual breakdown.

"Tomorrow may be too late . . . do it today!"

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

Anaconda Wire & Cable Company
25 Broadway, New York City

Please send copy of the Anaconda PM Plan, including posters, extra check charts, etc.

Individual .....

Company .....

Address ..... City .....

TRIMMED STANDARDS

One of the toughest jobs we face in these closing months of 1942 is the task of trimming our electrical and wiring equipment standards to the necessities of continuous, efficient production in industry and the minimum for housing.

It's tough because it is a reversal of all we have thought and talked of through the recent years of electrical progress. It's tough because it often calls for deliberately inadequate installations, the reclaiming of obsolete equipment and the interminable patching of systems that cry out for wholesale junking.

But the ways of war are tough, too. And, when we dig deep into the job, there is a great responsibility apparent, a responsibility for more precise engineering, more accurate application and more critical choices than we ever had before.

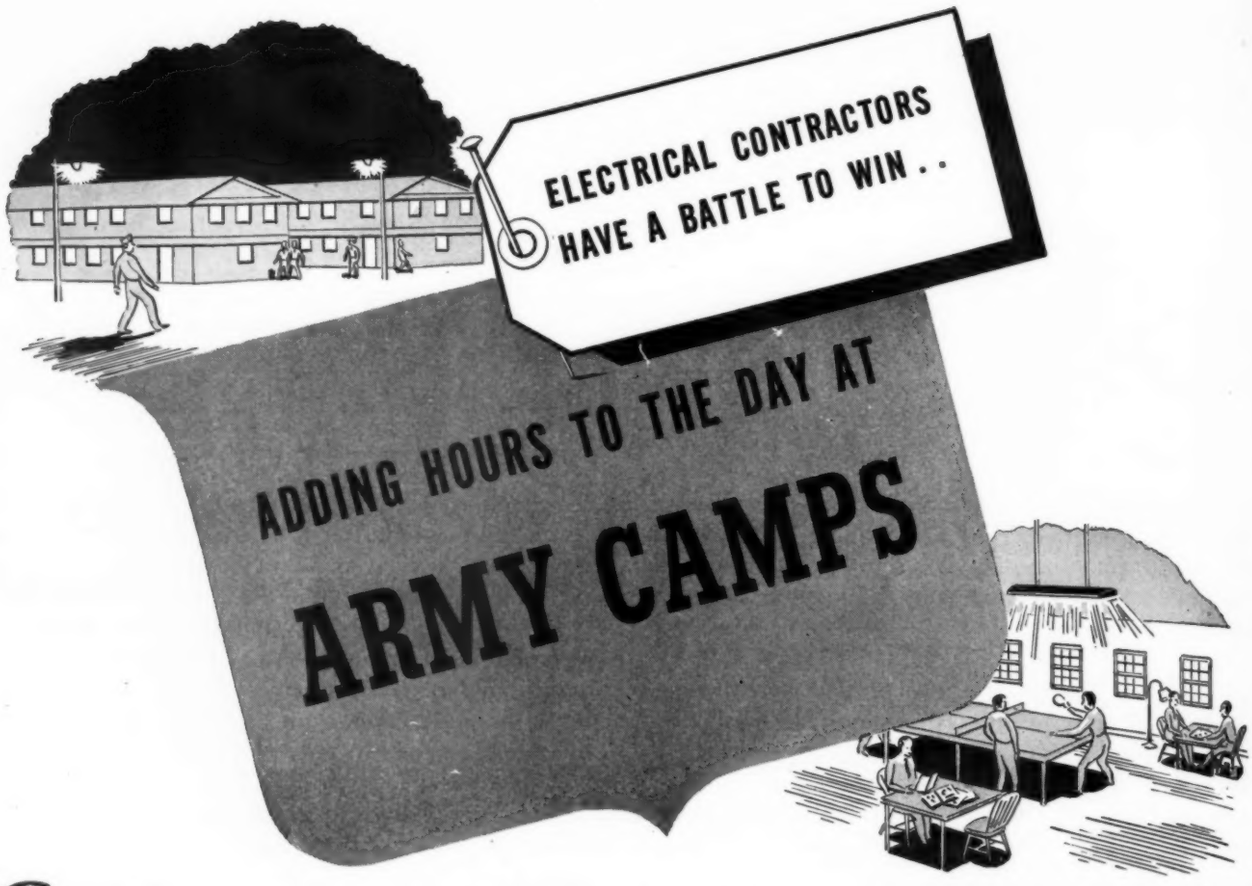
Time has become an important element of design and application. If we can assume a life span of five years instead of 20 or 30, important economies in critical materials are possible. In motors, for instance, there is a rule of thumb formula that for each 10 degree rise in temperature over the normal field load temperature the life of the motor is halved. So the WPB has asked that open type 40 degree motors be loaded to 125 per cent of nameplate rating. Such loading will certainly cut the life span of the motor but it will save copper and other critical materials now when we need them most.

In temporary housing planned for war plant workers, wiring is becoming skimpy. There is no talk of adequacy now. There is even some talk as to whether sufficient materials will be available for even rudimentary lighting. This policy bears watching and the whole-hearted cooperation of our industry with those responsible for the wiring limitations. Further economies in critical materials without sacrificing the necessities may be possible by engineering and ingenuity.

And in the maintenance of industrial and commercial wiring and equipment we've got to "wear it out and make it do". That's important because it takes planning and preventive care. It means literally nursing existing equipment for the duration.

For all of the limitations, the cautious skimping and sacrifice of standards, the job ahead is as big as ever. Efficient lighting, skillful wiring design and well planned power application is contributing magnificently to war production at a very modest cost in critical materials. And further progress in substitute materials and methods is constantly reducing the necessary quantities of rubber, steel and copper.

Liberal adequacy, future capacity, ample factors of safety, performance and fine craftsmanship are all essential to our peacetime schemes of industry progress. They are not relinquished lightly. But the electrical industry can have only enough materials to win the war. And that's all we want.



CONSTRUCTING a modern army camp means building a self-contained city, using electricity in all the ways that it can add to the efficiency, safety and comfort of the men.

Outdoor lighting is a big job, involving street lights, floodlights, fence lights, searchlights and the like. *Indoor lighting* in barracks, mess halls, recreation halls and other buildings must provide good seeing for men whose eyes are precious. *The wiring job* must meet demands for more and more electrical equipment and appliances in kitchens, hospitals, offices and training shops.

Instantaneous *communication* within the camp means more work for the electrical contractor. Fire alarm systems and warning signals may also be called for. Taken together, it's the kind of a job that can be quickly solved only when the local electrical contractor takes a hand in it.

No matter what the job you're tackling . . . industrial conversion . . . shipyards . . . air bases . . . defense housing . . . don't forget that GRAYBAR offers you the strongest possible *local* aid on equipment and supplies.

More than 200 manufacturers of the equipment frequently specified for these and other war jobs depend on GRAYBAR to speed their products to the point of need. Thanks to a nationwide experience on such jobs, your local GRAYBAR man can help you fulfill war contracts promptly and at a profit.

These Graybar-distributed products are widely used on Army Camp Jobs

Crouse-Hinds, Benjamin and ***General Electric*** outdoor lighting equipment—searchlights, floodlights, street lights, etc. Incandescent and fluorescent lamps and fixtures for every type of indoor lighting need.

Orangeburg NOCRETE fibre conduit for rapid underground installation without concrete encasement. Also self-protected underground cables.

Graybar Inter-Phones, ***Webster Electric*** Teletalk, ***Edwards*** Lokator and other signaling and alarm equipment.

General Electric Motors and motor control. Cable, conduit, wiring devices, panel boards, circuit breakers, fuses and miscellaneous supplies.

GraybaR

IN OVER 80 PRINCIPAL CITIES

GraybaR QUALITY SINCE 1869 * REG. U.S. PAT. OFF.

Everything Electrical . . . . THAT IT TAKES TO WIN!

Executive Offices: GRAYBAR BUILDING, NEW YORK, N. Y.

Construction—Builder of Bases

America's Great Peacetime Industry Goes to War

PUNCHED through 1,600 miles of trackless wilderness and rivaling the Panama Canal in strategic importance, the Alaska Highway will cut days and dangers from present supply routes . . . to Alaska . . . to the Aleutians . . . yes, to Japan itself!

This job, to be finished soon and well ahead of schedule, is but one example in thousands illustrating how construction sets the stage for our war effort . . . and why the construction engineer is vital to victory.

Back of America's busy production lines, expanding shipyards, growing cantonments and far-flung military bases is a series of swiftly executed construction jobs. Important jobs! ***For the construction industry is a builder of bases. Bases for production—for training—for defense—and for attack.***

To conceive and to carry through so tremendous a program in a race against time is typically American. It requires enterprise and the sort of versatility that has been acquired by undertaking every kind of job; from a Boulder dam to a drydock, from a Pennsylvania Turnpike to a housing project, from a Radio City to a railroad tunnel . . . and taking it in stride. War's demands in the eyes of America's construction men, are simply more of the same—for a grimmer purpose, and under heavier pressure.

The civil engineers who develop the necessary designs, the contractors who execute them and the manufacturers who provide the equipment and materials, are as much a part of this war as are the men who face the enemy. The results of their labors are recorded in mounting production figures, and will be indelibly written in the military annals of this war. Those 60,000 airplanes, 45,000 tanks and 8,000,000 tons of shipping that the President asked for in 1942 will be supplied because—and only because—the construction industry did a Herculean plant-building job first—and fast.

This is the fifth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Yes, construction, America's great peacetime industry, has gone all out for war. From a normal 6½ billion dollars in 1938, it got into its war stride last year with a 11½ billion dollar volume. And under the impetus of Pearl Harbor, the 1942 figure now promises to reach the unprecedented total of 15 billion dollars. "If buildings would win the war, Hitler would be licked now", said Lieut. Gen. William S. Knudsen recently. Which emphasizes the further fact that the construction industry was the ***first*** to go to war.

The technical and managerial talent that is accomplishing this mammoth job has had to find its strength and resources within itself. No possibility of "conversion" here! Only years of varied construction experience enabled it to tackle and to achieve the manifold tasks that building for war demands.

Take that cornfield, for instance, that Henry Ford picked for his record-breaking bomber plant. The spring mud was soft and deep when contractors moved in last year. They were entering a race against an almost impossible time limit. Before they could even begin on the plant itself, they had to build roads, lay a 4-mile water supply line and install a complete sewerage system with its disposal plant. But such varied jobs—each big in its own right—merely were antecedent to running up the framework and enclosure for the 60-acre factory itself. Or to using road-building methods to pave a floor that was the equivalent of 25 miles of 20-foot wide concrete highway.

It was a race against the approaching winter, and to win it they had to push their $1,000,000 worth of construction equipment to the limit—day and night. But win they did! It is accomplishments like these that explain how the nation's aviation factory floor space jumped from 18,000,000 to 60,000,000 square feet in

the past two years . . . why Fortresses and fighter ships are beginning to turn the scales of war in our favor.

"Somewhere in the Southwest" the Army called for a training base. The contractor who answered that call summed up his performance in characteristic fashion: "Beginning without so much as a contour map we had a $10,000,000 project ready for operation within 90 calendar days, and saved 3½ million dollars of the estimated cost".

At another Army camp a contractor assembled a crew of 20,000 men who put together 1,400 buildings in 125 working days, along with a sewer system, a water-supply and a street layout of which many a fair-sized city might be proud. This job swallowed up 2,000 carloads of lumber, and 26,000 kegs of nails. So perfect was the teamwork, from the general manager down through the hundreds of superintendents and foremen to the specialized crews, that as many as seventy buildings were erected in one single day.

But versatility and experience are not the only qualities that the construction engineer has in his tool chest. He has ingenuity, and he needed it when steel, copper, zinc and aluminum had to be used for combat equipment, and were denied him. Great hangars, conventionally of structural steel, were turned out with record-breaking timber arch spans. Reinforced concrete factories were designed to require only 3 lb. of steel bars per square foot instead of the customary 5 lb. Asphalt-impregnated paper was substituted for copper in flashings, cement-asbestos for galvanized steel in duct work. In the face of a materials shortage, he continued to build bases—safely, economically, and on time.

Construction ingenuity, too, is back of the records in Liberty ships, in war housing and a host of other facilities. Indeed, it was the construction industry that stepped forward to assume the bulk of the emergency shipbuilding program, leaving established yards free to handle more specialized Navy work. Naturally, it was easy for civil engineers and contractors to build the shipyards, but building ships was another story. It is a far cry from steel ships to conventional engineering structures, yet, drawing upon their bridge and building experience, the men of construction have turned out ships faster than they were ever built before.

How was this possible? . . . because the construction man sees every job as a new problem, views every precedent as something to be discarded in favor of something better. So instead of assembling the myriad separate pieces of each ship on the ways, he fabricated them into huge built-up sections. These he swung to the ways and welded them into place in a fraction of the time required by old methods.

Again, the demands for wartime housing for workers in industrial areas, at Navy bases, and near Army concentrations, have altered the meaning of "residential construction". The building of individual houses has given way to a form of multiple-unit project that calls for the skilled services of the architect, the civil engineer and the large contracting organization. On one such project, for example, a contractor experienced in large building and bridge construction employed an extensive system of prefabrication and site assembly that made possible the completion of 5,000 houses for war workers within five months.

All these activities, within the United States, parallel the achievements of other industries that serve the men at the front. But construction knows no continental limits. Its men are serving throughout the network of defense bases built in the West Indies, Greenland, and Iceland, and in the offensive bases that are taking form in the jungles and deserts of Africa, the harbors of the Persian Gulf, and the plains and mountains of Australia and Alaska. Already in this war, as in the last one, construction crews, like those at Wake and Guam, have dropped their peacetime tools to fight shoulder to shoulder with their comrades in uniform. Construction follows the flag to the farthest outposts in this global struggle.

* * * *

But while the construction industry thus serves the special needs of the armed forces, it must look after its job at home. It must keep the highways serviceable, the water supply safe, sanitary facilities adequate. There are home chores that cannot be neglected even in war.

And when we finish our No. 1 task of winning the war, the construction industry will again be called upon to help re-establish peacetime employment and to stimulate the normal industrial activities of the nation. It will raze, redesign and rebuild; it will bring modern sanitation to urban dwellers; it will safeguard fertile areas and cities from disastrous floods; it will improve all forms of transportation; it will design and build the facilities that will be needed to reconvert from war to peace. Its vision, versatility, experience and ingenuity will be as indispensable then as they are vital now.

Today it is building the bases that are needed back of every battle-line. Tomorrow it will build for a new and better era. Today it is laying the foundation for the victories that must be ours. Tomorrow it will lay the foundation for the peace that will follow these victories. In war and in peace the construction industry is the builder, the harnesser of nature's forces.

President, McGraw-Hill Publishing Company, Inc.

Harry Condo
heads the motor repair service and its natural ally—motor maintenance.

CONTRACT MAINTENANCE

This Chicago electrical contracting and motor service firm sells electrical maintenance on a contract basis, a vital service for today's emergency conditions. Here is their plan and method of operation.

By Ted L. Hankins
who has charge of Condo's electrical contracting business and also handles part of the maintenance work.

ELECTRICAL maintenance is vital at all times to plants and buildings where any type of electrical equipment is operating. It is doubly important today when war emergencies demand 24 hour heavy duty operation; when spare equipment and parts are practically unobtainable; when production schedules must be maintained or increased; when skilled labor is at a premium and when the general morale of the home front must be kept at the highest possible level. That is the principle on which the Condo Electric Company operates its electrical maintenance department.

Our firm has operated a maintenance contract service in connection with our motor repair and wiring contracting business for several years. Maintenance contracts include laundries, printing plants, newspaper and magazine publishers, general factories, hotels and office buildings in the Chicago area.

Our contracts are divided into routes, zoned in different sections of the city. A man is assigned to each route. This enables us to reach a man near the location of trouble for any emergency call on contracts or general repair service. By doing this we save the customer time and expense for traveling from the shop.

Types of contracts

There is nothing involved or complex about our maintenance system. We have trained men who are in the field every day making the inspections for which our customers have contracted under one of the following basic types of agreements.

1. *Time and Material*—In this type of agreement we make the specified number of regular inspections for which our customers pay us our cost of labor and material plus a percentage for overhead and profit. Any unusual repairs such as a motor burnout or control failure is paid for by the customer as a separate item and on a similar basis.

2. *Straight Contract*—Here the customer contracts with us to keep his motors, controls and other electrical equipment in operating condition for a predetermined sum payable in monthly installments. Under this type of contract we take on full responsibility for the condition of the equipment after the contract becomes effective. We agree: to make inspections at specified intervals; be subject to calls for emergency service; repair or replace any worn or defective parts of apparatus listed in the contract; and to maintain a general supervision of the apparatus for the purpose of keeping it in proper working order and condition.

3. *Elevator Maintenance*—Elevator maintenance is contracted under two different forms: (a) To cover electrical equipment only; (b) To cover electric and mechanical equipment including motors, controls, cables, drums, etc. This type of contract is usually written on a five year basis and includes twenty-

CONTRACT MAINTENANCE *involves skillful mechanical work, knowledge of motors, drives and auxiliary equipment as well as routine oiling and cleaning.*

INSTRUMENT TESTS *check operating conditions, detect unnoticed trouble and reduce call-backs.*

four hour service everyday of the year.

Although our maintenance contracts are primarily for motors and control apparatus, maintenance service could be organized for distribution systems, disconnect switches and panelboards, and lighting equipment. Since inspection intervals for this type of equipment are much greater than for motors and controls, the plants generally want one of their men to do this. However, with the manpower problem as it is, this might be a good field for contract maintenance.

Men and Schedules

Although cleanliness is the essence of maintenance, our men must be more than just motor wipers and oilers. While cleaning and inspecting a motor or a piece of apparatus they must be able to check it and determine if there are any condition present that might cause a failure or future breakdown. We have always contended that the best maintenance men are those who are trained in the shop and who are a combination of electrician and machinist. Not only must our maintenance men be good mechanics and electricians, but they must possess ability to meet people, since they are always in contact with our customers.

Estimating for Maintenance

To prepare our estimate for maintenance service we first make a complete survey of the plant and equipment involved to determine:

1. Number of motors and auxiliary equipment.
2. Type of equipment—a.c. or d.c.
3. Age and present condition of the equipment.
4. Frequency of operation and type of duty.
5. Operating conditions — normal, dusty, damp, wet, corrosive fumes, etc.
6. Type of operator—experienced or new. This determines the probable amount of unusual abuse the motor and equipment might get.

Then we figure our inspection labor plus an estimate, made from experience, of the number of parts we will have to replace and repairs we will have to make during the life of the contract; add it all together and put on our overhead and profit.

All the above conditions have a direct bearing on the amount of repairs and callbacks that might be necessary during the life of the maintenance contract. Overlooking any one of these might mean the difference between a profit or loss on any particular contract.

Today, with war sub-contracting on the increase and more and more small plant conversion, the maintenance field assumes a wider aspect. Every plant needs electrical maintenance, and a jack-of-all trades will not make an efficient electrical maintenance man. Just a motor oiler won't do. He must know how frequently to oil different types of motors and be able to detect approaching trouble. A motor burnout and production shutdown is costly; both to the plant and to the war effort. That is something that can and must be methodically prevented.

Today's manpower problem also opens the plant doors to outside contract maintenance. In many of the larger plants, expansion has proceeded so rapidly that plant maintenance crews just can't spend enough time on their electrical maintenance duties. Trained and experienced men are at a premium and the duties of a few have been multiplied many times.

The contractor or motor shop who has organized for contract maintenance has the skilled manpower, equipment and experience to assume the responsibilities of plant electrical maintenance. Plants who do not maintain organized crews would eliminate a healthy headache if they would turn this job over to maintenance contractors.

With new equipment and spare parts so hard to get, it's going to be maintenance that will keep the wheels of our war industries turning; that will keep our offices heated and lighted; and that will keep our homes in first class condition. We've got to do the best with what we now have. A maintenance contract is an insurance policy against electrical system failures.

CODE ADOPTS WAR RULES

The new Supplement to the 1940 National Electrical Code reveals new amendments for the duration and new interpretations of existing rules in the light of existing materials scarcity. This analysis of the Supplement reviews the new provisions and illustrates the important changes.

By John M. Turnbull
Service Engineer for the United Electric Light Company, Springfield, Mass.

THE 1940 National Electrical Code has had a number of Interim Amendments issued as the September 1 Supplement to meet, in the first place, our war situation, and secondly, to keep up with progress in wiring developments.

To begin with, the lack of rubber presented insulation problems which simply had to be resolved with dispatch and revised wiring regulations issued accordingly.

On the other hand, the shortage of copper has and will force us to use whatever stocks we have to the utmost and has focused thought on the economical transmission of maximum amounts of power over minimum-sized conductors.

One of the main changes has been to avoid the use of rubber on grounded conductors, and to permit of substitute insulations on hot wires. Progress in wiring developments and in industry standardization can be exemplified by the brand new Code article having to do with Machine Tool wiring methods, control equipment and their protection.

It should be noted at the outset that some of these Code Amendments have been approved for the duration of the war emergency only, for instance No. 69 on Emergency Insulation. Others, like No. 70 on Machine Tools, are new material in the Code.

There has also been issued a number of Official Interpretations of the 1940 Code. A study to provide an understanding of how these amendments and interpretations are bound to alter our business seems timely.

Conductors

Conductor standards have been radically changed. Smaller conductors are recognized, current carrying capacities have been increased, we have uninsulated neutrals and paper-insulated hot wires, braid specifications are different and metal-sheathed systems are limited, operating temperature ranges have been widened, more wires are permissible per raceway, and open wires may be spaced closer together.

1937 Code Values

The first important war ruling was the revertment to the 1937 current values, which have been restored for Code grade rubber wires (No. 6 is again good for 50 amperes). There is this restriction that these reinstated values are not to be applied to Continuous Loads. The wording of Continuous Operation on page 10S of the supplement should be studied. A recent illustration of such misuse was that of a No. 4/0 Type R run to a capacitor drawing 205 amperes. The conductor soon gave trouble under this 24-hour-a-day connection. The 1940 Code tables for Type R wires were drawn up on the basis of just such continuous loading.

Varnished Cambric

Varnished cambric may be made up into armored cable and used for the same purposes as the rubber-covered type, in dry locations.

The rated current capacities of varnished-cambric conductors have been increased for sizes No. 3/0 and up in raceways or cables, as shown on the accompanying tabulations. See revised Table I of the Supplement.

Type EI Insulation

Emergency Insulation, new Type EI, has been made up with an insulation of treated paper with an outer braid. There is no rubber used in this type of wire. EI building wire may be used up to 600 volts, in dry locations only, for open work on insulators, and for exposed non-metallic sheathed cables. Lead covering will allow for its use in wet locations. The assembly looks like regular non-metallic sheathed cable.

Uninsulated Neutral Cable

Non-metallic sheathed cable containing an uninsulated neutral conductor has been approved for use on circuits not over 208 volts to ground. While it certainly is not a revolutionary thought to use bare wires for inside wiring, the technique of their installation within boxes will bring forth new ideas. Its

employment furthers certain trends such as the mandatory use of outlet boxes of non-conducting materials and the requirements to bond distribution cabinets to the grounded conductors. This cable having a bare wire must not be used beyond the final outlets nor for extensions to existing fully-insulated circuits because, of course, such use would involve the possibility of polarity reversals.

The request for this type of wiring was made in order to conserve materials, and it also forms a most compact assembly.

Grounded Conductors

Rubber is too precious to be put onto "white" wires intended for general use, and Government orders now prohibit the use of rubber on grounded neutral conductors. For a.c. systems, weatherproof braided wires, also emergency insulation, have been O.K.'ed as grounded conductors in any of the 0-600 volt Code wiring methods; that is, they may be used in cables, run exposed as in open wiring, or pulled into raceways.

Open Wiring

A most interesting installation change is the permission to reduce the spacing between conductors of 600-volt open wires from 4 to 2½ inches. This will improve the voltage regulation of circuits by reducing their inductive reactance. This is one of the ways by which copper can be used to better advantage, the lower voltage drop making practicable the carrying of larger loads over the same circuits.

Incidentally, we are now to have No. 20 gauge cords for applications where these are not likely to be moved frequently. The rated capacities of some cords have been increased. No. 20 cord is rated at 3 amperes.

Services

It appears from the number of questions arising from time to time regarding the suitability of emergency service construction that the Code might be made more explicit. However, these questions of physical arrangement and related factors are often rather involved matters. Recently interpretations have been made to the effect that structural separation and reliability of emergency services are matters for the enforcing authority to rule upon in each case.

Bare neutral has been ruled as acceptable in underground services.

In line with the action taken by the Emergency Committee at its September 10 meeting, bare conductors are now approved for use in open individual service drops. The grounded drop to the building may be bare. Hot service wires may be bare to within 10 ft. of the building. Within 10 ft. they must be rubber covered or weatherproof; another example of doing without rubber.

Grounding

The grounding rules have been amended and interpreted. The Code now recognizes the common practice of grounding range frames to the neutral but has stipulated conditions which must be satisfied for approval of this form of connection. Ranges so grounded must not be in contact with other grounds, thus there will not be current flowing over such contacts.

The regulations governing the grounding of service equipment now permit the use of the neutral conductor for the grounding of equipment ahead of the service switch. This is a practice which helps to clear up trouble because when an insulated conductor goes to ground, the fuse blows more readily and so ensures the disconnection of the faulty equipment.

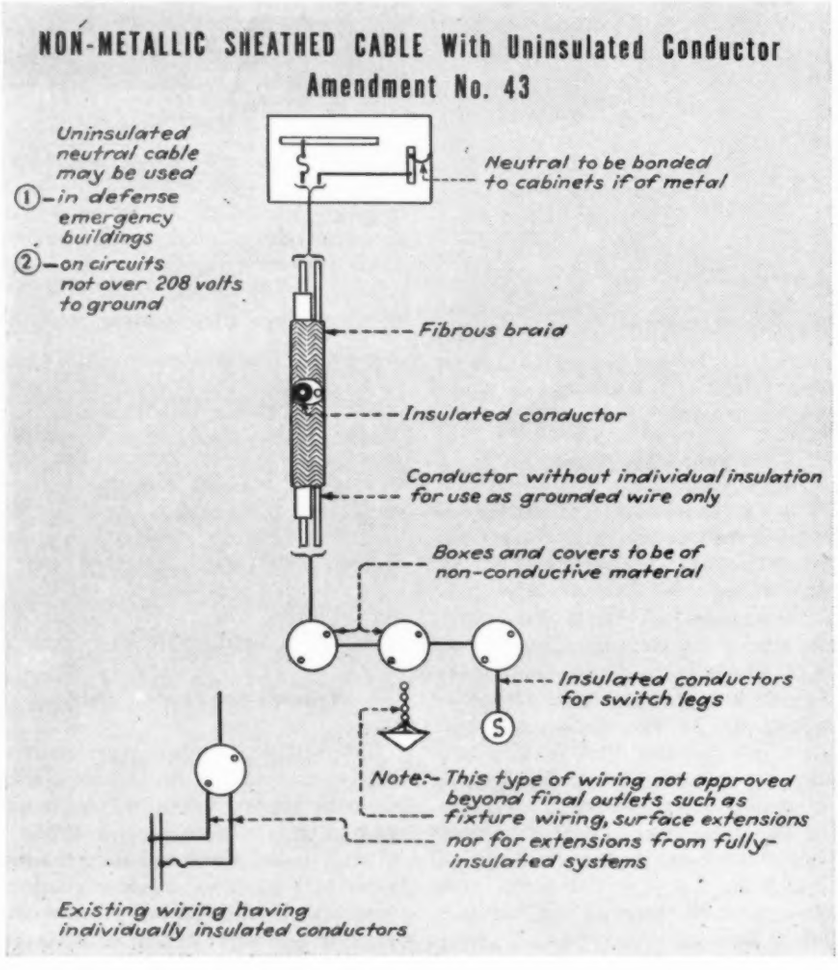
It has been ruled that general grounding rules apply to fluorescent fixtures.

Switches

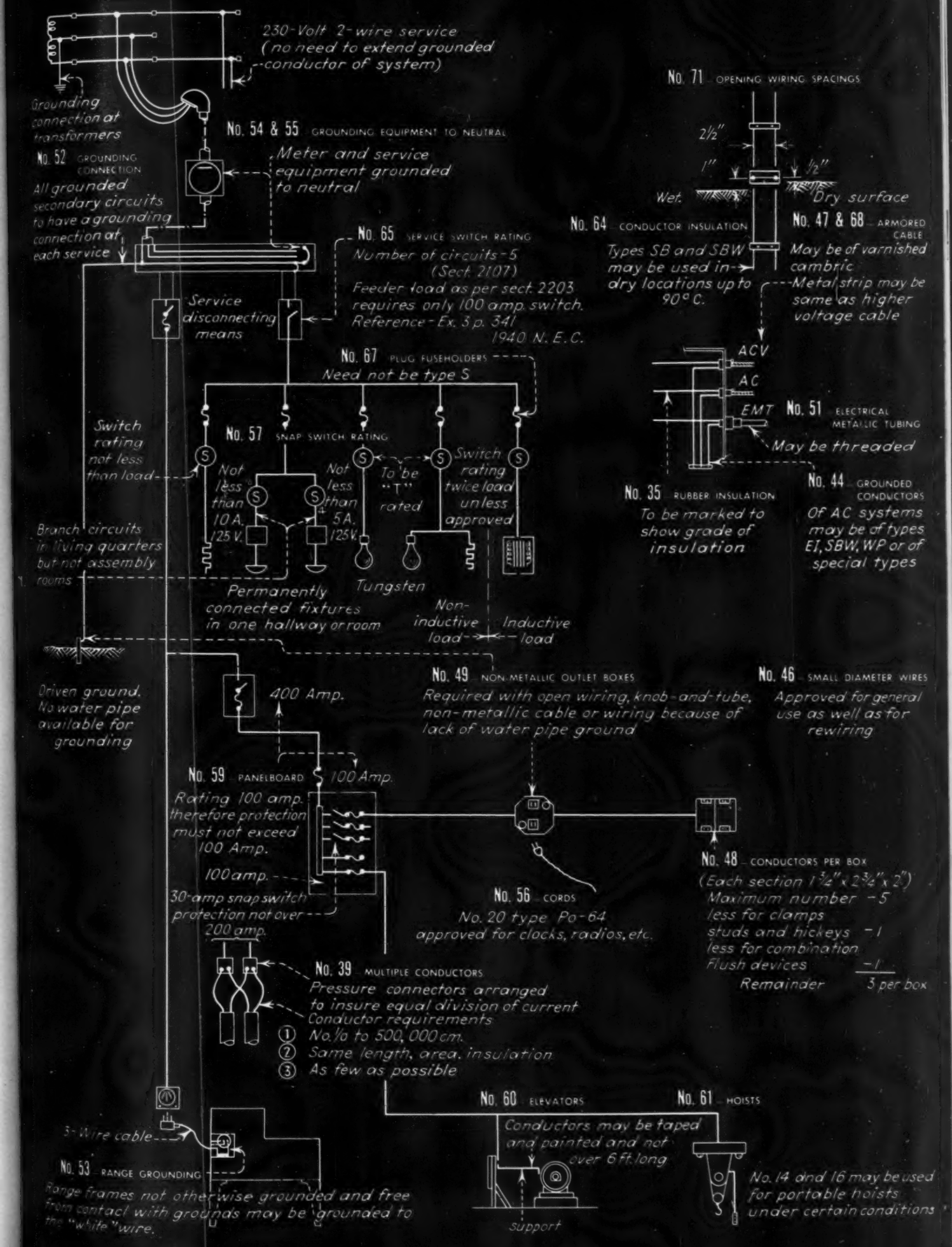
Service, snap and welder switch ratings have been regulated. The service switch will need only to be rated in accordance with branch circuit requirements, and this change should conserve materials. Snap switches are to be good for the loads they serve, inductive or non-inductive, as the case may be. "T" rated switches will be required for tungsten lamps. Switches for transformer-type welders may be general-use type of twice welder rating when the welding equipment power factor is at least 75%, if not, then horsepower-rated switch will be required.

Likewise, a single disconnect for a group of motors over 2 HP. must be of the HP. rated type.

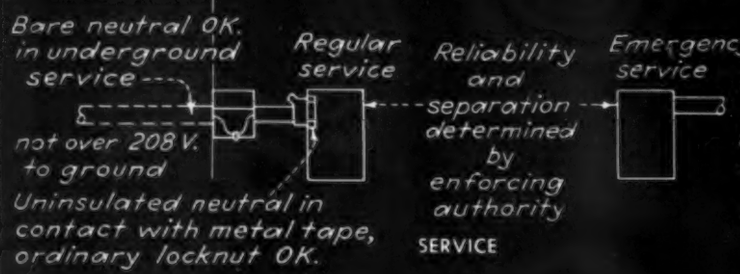
The new rule in the 1940 Code which called for a separate disconnecting means for higher-voltage fuses or cutouts has been interpreted to bring out



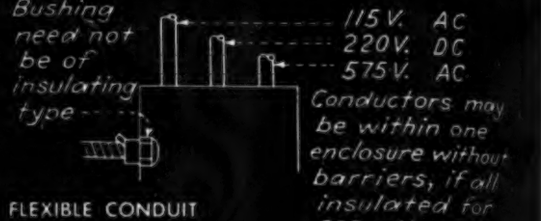
INTERIM AMENDMENTS OF THE SUPPLEMENT TO THE 1940 N.E. CODE



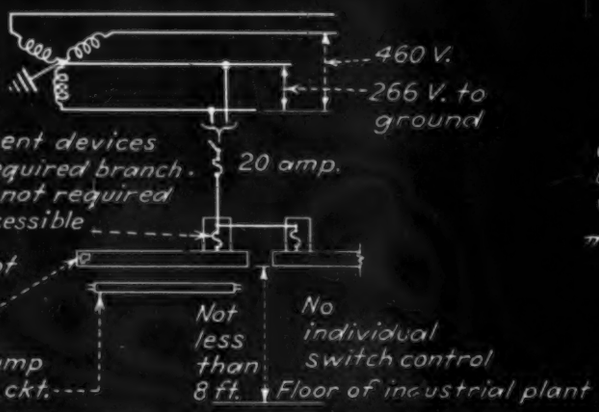
OFFICIAL INTERPRETATIONS—1940 NATIONAL ELECTRICAL CODE



SERVICE

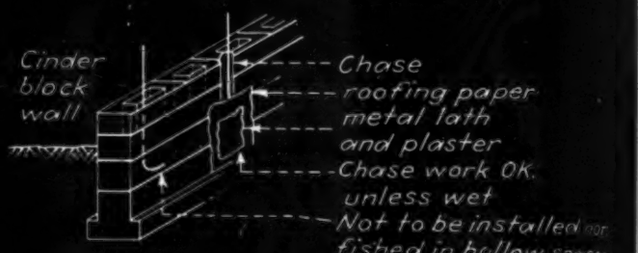


FLEXIBLE CONDUIT

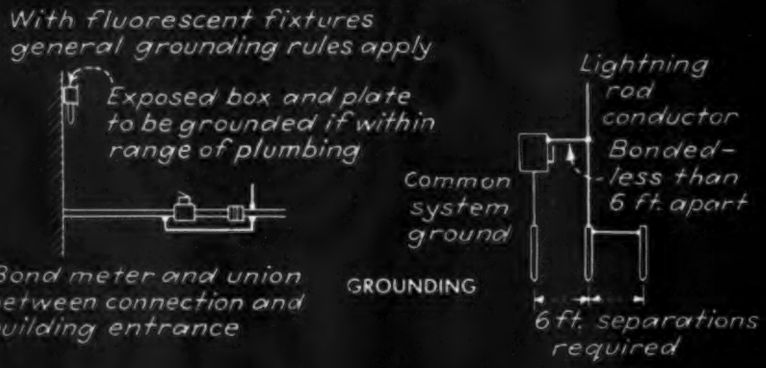


FLUORESCENT FIXTURES

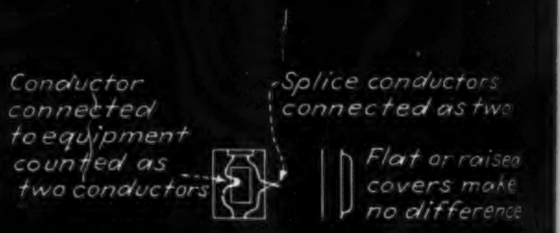
DIFFERENT SYSTEMS



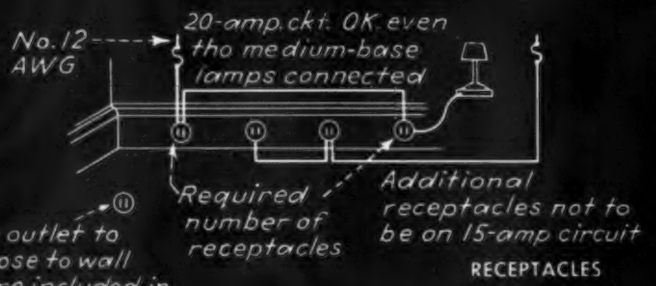
NON-METALLIC SHEATHED CABLE



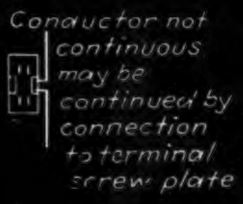
GROUNDING

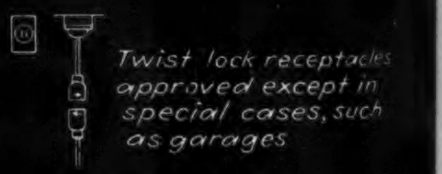


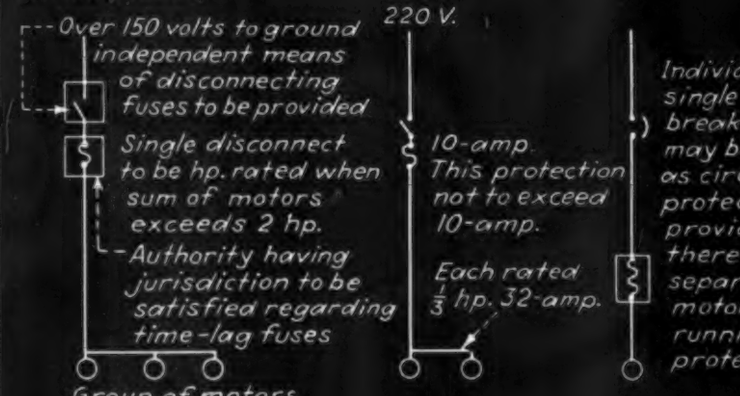
CONDUCTORS PER BOX



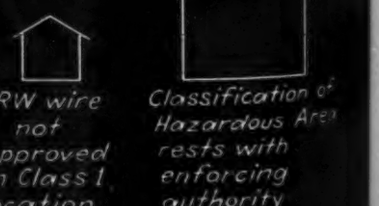
RECEPTACLES







MOTORS



HAZARDOUS LOCATIONS

that it is simply the provision of an independent disconnecting means that is specified.

Fuses

The new tamper-resistant Type S plug fuses have had a long history, and the latest thing to happen to them has been the deletion, for the duration of the war, of Code section 2452 which made their installation mandatory after November 1 of last year. Therefore, the Code will allow but not now require that Type S fuseholders be installed.

A practice coming into vogue is the mounting of fuses on or within fluorescent fixtures, and this matter has been the subject of an interpretation that such an arrangement is O.K. provided such fuses are additional to the regularly required branch circuit overcurrent protection.

The acceptance of local conditions surrounding the use of time-lag fuses has been set forth as a matter for the jurisdictional authority to pass on before these special fuses are installed.

Panelboard

Recent panelboard rulings are significant. Panelboard protection will hereafter be limited to 200 amperes or less. Snap switches of 30-ampere or less must be protected at not over 200 amperes. Another item is an amendment by virtue of which neutral conductors must be bonded to their enclosing metal cabinets where the new uninsulated neutral cable systems are installed. This will mean the bonding of bare wires to the metal cabinets containing them.

Boxes

The use of non-metallic wiring systems, as compared to the metal-clad variety, has been advanced by amendment No. 49 which requires that outlet boxes be of porcelain, bakelite or such non-conductive material, and which therefore prohibits the use of metal boxes where there is no water pipe available on the premises for grounding of the wiring system. This ruling applies to open wiring, knob-and-tube and non-metallic cable systems; however, insulating boxes are acceptable with these systems regardless of grounding conditions.

Interpretations and an amendment have been issued to clarify that section of the Code governing the crowding of outlet boxes, or the number of conductors which may be installed therein. Combinations of hickeys, clamps and studs count as one conductor, while combination flush devices further reduce the permissible total by another one.

CURRENT CARRYING CAPACITIES OF CORDS

Amendment No. 40

SIZE	AMPERES	EXCEPTIONS	
		Hard Service : Vacuum Cleaner Types S, SO, SJ, SJO, SV	Heater types AFS AFSJ, HC HPD, HSJ
20	3		
18	5	7	10
16	7	10	15

Fixtures

A splendid new development has been the fluorescent fixture which needs only one auxiliary for four 100-watt tubes, for operation on 265-volt circuits. It cuts in half the amount of metals required. Such a lighting supply can be derived directly without transformers from 3-phase, 460-volt power systems, with consequent reduction in the necessary amounts of copper compared to transmission of lighting energy at say 230 volts. Official interpretation No. 229 has given Code sanction for such systems, using lamps over 150 volts, and under certain installation conditions. Many of the large new airplane factories are using this system. See the first interpretation on page 1S of the Supplement.

Code rules have been officially interpreted that Mogul fluorescent lamps are approved for use on 20-ampere branches.

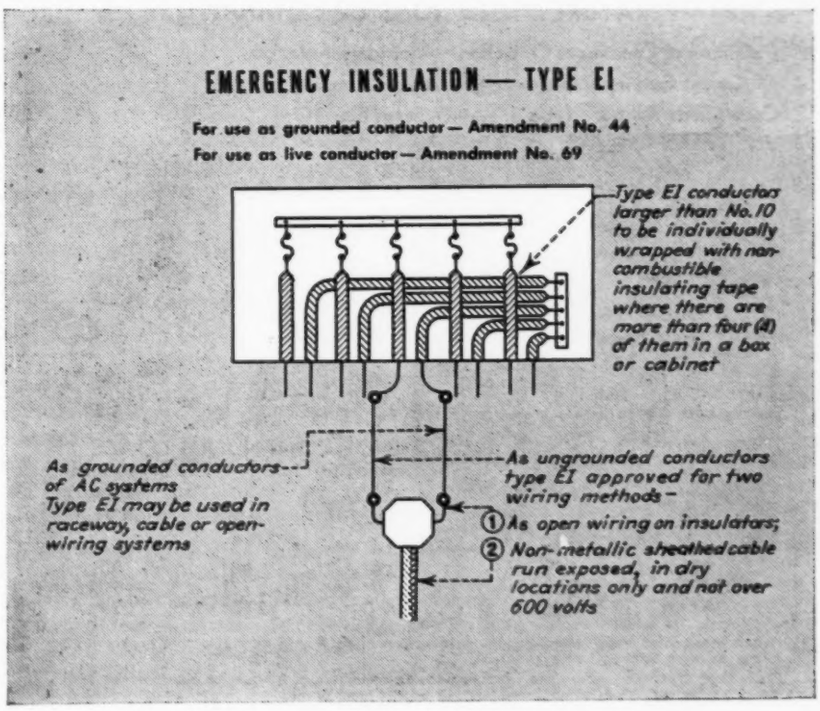
Receptacles

Code section 2110 which requires that a specified number of receptacles be installed in certain rooms of the home has been explained in interpretations of what may be considered as acceptable as a required receptacle. For instance, floor receptacles may be counted only where they are located close to the walls.

Other recent explanations have had to do with approval and design of receptacles.

Motors

One amendment to the motor article of the Code rules will regulate the increasing use of built-in protective devices, and under one condition approves



NUMBER OF CONDUCTORS IN CONDUIT OR TUBING

Revised Table 4 **Amendment No. 50**

Examples of Changes:

NEW VALUES	SIZE	SUPERSEDED VALUES
1-in.	7—10	1¼-in.
1¼-in.	3—2	1½-in.
2-in.	3—4/0	2½-in.
2½-in.	3—300,000 cm	3-in.

protection at 135% motor nameplate rating. Here the higher setting of the overcurrent device applies to open-type a.c. motors having a normal 40° C. rating.

Protection provisions for small motors were covered by interpretations 198, 203 and 221.

Ranges

An alternate table of lowered demand factors on range feeders will provide for the general transfer and installation of ranges to existing circuits even when larger ranges are to be installed than the circuits were designed for. Another way to use copper to the fullest advantage.

General

The Code has been amended to permit threading of thin-wall conduit (electrical metallic tubing). Long-coliar couplings are available. Fittings such as box connectors which cut their own threads are on display.

Busway taps or extension of at least one-third capacity of main run will not be required to have separate overcurrent protection provided the busway is not in contact with combustible material.

Rules for wiring of elevators between controllers and motors or generators have been amended. Along this line a striking new allowance is that of 110% rated current on conductors of intermittent duty hoists and cranes.

The general use of conductors in multiple is approved, and this sound practice should allow for the efficient use of smaller cables, thus saving copper, conduit and installation time. Table 4 has been expanded, and now includes many new combinations of conductors in different conduit sizes applicable to multiple conductors.

A.c. and d.c. systems may occupy the same enclosure provided all wires are insulated for the highest voltage involved, according to recent interpretations.

Non-metallic sheathed cables have been passed upon as acceptable in a chase of a cinder block wall, but not within its hollow spaces.

Flexible conduit bushings do not need to be of the insulating type.

The derating factor of 80% is not called for simply because some control wires are run in with the motor leads, bringing the number of conductors in the conduit to more than three. Nor does it need to be applied twice where the 20% reduction has already been made on account of the continuous type of load to be served, as store lighting.

Hazardous locations have been the subject of four interpretations. For instance, Type RW wires are not approved for Class 1 locations where conductors would likely be exposed to gasoline.

Additional Changes

We may expect further changes as needs arise to depart from peacetime standards. In the meantime, we can and shall proceed in an orderly practical way, governed by the National Electrical Code Standard. After all, the prime purpose of the Code is, as it always has been, the practical safeguarding of persons and of buildings and their contents from electrical hazards.

TYPICAL EXAMPLES OF AMENDED TEMPERATURE LIMITATIONS OF CONDUCTORS

Definition of Continuous Operation—Amendment No. 66

Current Carrying Capacities—amperes

Code Grade Rubber—Type R—Amendment No. 41 in Raceway or Cable

TABLE 1 1940 Supplement	SIZE	TABLE 1 1940 Code
15*	14	15
50*	6	45
125*	0	105
225*	4/0	160

* Note: These supplement values apply even though 1) there are more than 3 conductors in a raceway or cable and, 2) room temperature exceeds 30° C.

Varnished Cambric—Amendment No. 63

CONDUCTORS IN AIR Table 2—1940 Code		NON-CONTINUOUS LOADS Revision to Table 1—1940 Supplement		
Types V AVB	AVA	Size	V AVB	AVA AVL
30	39	14	23†	28†
99	119	6	68†	80†
245	287	0	157†	190†
383	446	4/0	270†	275†

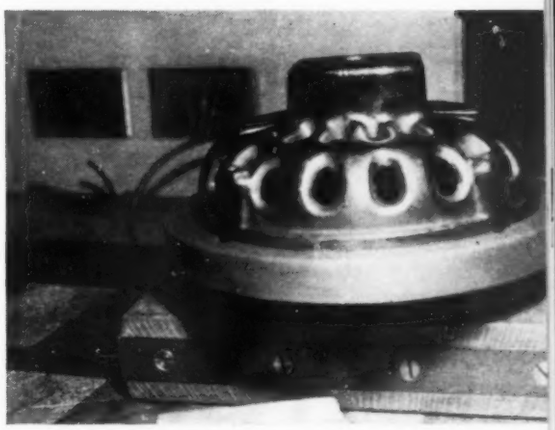
†These capacities apply even though 1) there are more than 3 conductors in a raceway or cable 2) room temperature exceeds 30° C.

Definition: Operation where the load exceeds three consecutive hours or six non-consecutive hours at the maximum rating listed, during any 24-hour period.

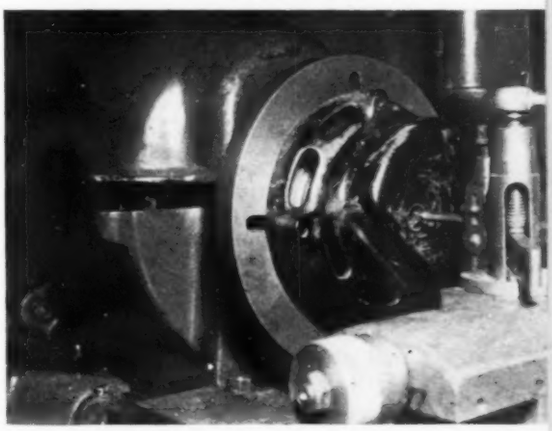
Making Motor Bearings FIT

This Duluth, Minn., motor shop uses under-sized bearings on fractional horsepower motors and bores them to fit the shaft. A specially designed face plate jig holds end bell and bearing in lathe during boring operation.

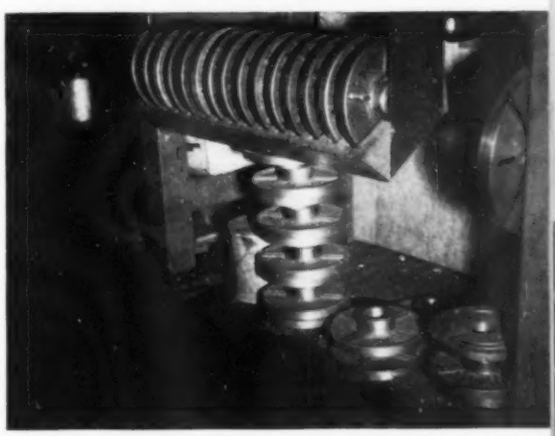
By Frank M. Mielke,
President
Mielke Electric Works Inc.
Duluth, Minn.



A SNUG FIT—*End bell of motor is fitted into the groove of the supporting jig before being set in the lathe. Fit is so snug that bolts are seldom required. A mallet is used to tap the end bell into position*



ON LATHE SPINDLE—*Jig-mounted end bell is set on lathe spindle. Boring tool is guided into bore of the bearing, enlarging it to proper shaft size.*



JIG STOCK—*Grooved end bell jigs are stored in readily accessible rack under bench directly opposite lathe. Spare blank jigs are stacked on the floor ready to be grooved for new motor sizes that come into the shop.*

WE have found that a large percentage of small motor trouble is due to ill-fitting bearings. To insure against any motors repaired in our shop showing up with that basic trouble, we have made it a policy to install undersized bearings and bore them out to properly fit the motor shaft. We use the boring technique rather than reamers, since we feel that they tend to follow the course of the original bore, and if it is not dead true the reamers will be of little value.

We wanted to do this boring operation in a lathe, so we faced the problem of rigidly holding the bearing while it was being bored. The solution lay in the design of a face plate jig that would hold the motor end bell—into which the bearing had been pressed. These jigs or face plates, 40 in number, we had cast, then rough machined them with the hub finished and threaded to fit the spindle of the lathe. Each jig contains four slots through which the end bells can, if necessary, be bolted to the face of the jig. Into the face of each we cut one or more circular grooves to snugly accommodate the rabbet fit of the end bells. The grooves are snug enough that bolts are seldom necessary to hold the end bell—merely tapping it into the groove with a mallet is enough. However, bolts can be used in the slots if desired.

The operative steps include: pressing the bearing into the motor end bell; mounting the end bell to the proper jig; placing the jig on the lathe spindle and boring to size.

Our stock of grooved jigs now number 18, which accommodates 44 different sizes of end bells. These are stored in a conveniently accessible rack suspended under a workbench directly opposite the lathe. Spare blank jigs are kept on hand for grooving to fit any new motor sizes that might come into the shop.

This may sound like a lot of work and fussing over small motor bearings, but it actually is not. Once the jigs are made and grooved, it takes less time to bore the bearings to exact size than to ream them, and when we are finished we know that we have a good, clean, true bore. The accuracy of this method has been proved by the fact that seldom, if ever, do we have to dismantle a motor because of bearing trouble after it has been assembled. When you consider the number of small motors that go through the shop and the time that we would lose if we had to dismantle even 10 per cent of them to correct ill-fitting bearings—our seemingly fussy but accurate method more than pays for itself. It makes a perfect job and creates customers' confidence—a vital necessity in the motor service industry today and always.

OUTDOOR INSTALLATION *of a light source and receiver at a typical corner of the "invisible fence". Units are aimed at other units further down the fence line. Actual corner of the invisible fence is the point where the light beams intersect.*

Infra-Red Beam PLANT

ANTI-SABOTAGE EQUIPMENT *consists of the light source (left) and the photocell receiver at the right. The case in the center is used for both units.*

WAR breeds saboteurs bent on disrupting our arms production. And that makes industrial plant protection a problem of the first order. They may strike at our large assembly and manufacturing plants or—and here is a logical target—at any of the thousands of smaller subcontracting plants now doing war work.

We are all familiar with the various protective systems now being used—guard patrols, electric fences, fence and building lighting, yard floodlighting and so on. But what if the lighting systems should be damaged or turned off during a blackout? What exterior protection is left to aid the guard patrol under such conditions? The photoelectric cell and black light is one answer to the problem.

The photoelectric cell already occupies a valuable place in industry as a means of counting, sorting, conveyor control, color matching and production control—all operating on the principle of an interrupted light beam making or breaking the control circuit. Now, it assumes the role of a watchman.

Add to the photoelectric cell principle an infra-red beam, and we have a means of projecting an invisible fence around any plant property that needs protection. By using sectionalized zoning and connecting the photo cell to light or audible signal circuits, the presence of a trespasser in any section of the plant property can be determined—even during a total blackout.

This anti-sabotage equipment utilizes the familiar photoelectric cell and a light source equipped with an infra-red filter which cuts off the light rays at 7200 angstrom units. The light source projects an accurately aimed beam of infra-red light at the photocell (Receiver) located some 250 or 500 feet away. The units can be arranged so that a series of protective invisible light beams can be projected around an entire plant as shown in Fig. 1 and Fig. 2. And the units, being small, adapt themselves to easy camouflage. (Fig. 3.) Each light beam or series of beams can constitute a definite zone. Interruption of any one of the invisible beams will, when so connected, actuate an alarm indicating what zone is being trespassed.

There are a number of different schemes for alarm circuits. Each zone may be connected to an audible alarm, such as a bell or horn; or, silent pilot light signals may be substituted for audible alarms, or the zoned photocells may be connected to protective glare lighting circuits which will turn on floodlights when the light beam in that particular area is interrupted. These floodlights may be arranged to operate on emergency circuits and may be equipped with necessary switching to make them inoperative during a blackout. Lamp or audible signals would then be used.

Prime Considerations

The exact plan of installation will vary with the individual plant problem and only a general scheme is shown in the accompanying illustrations. Specific plans and details are provided by the manufacturers when they design the complete protective system. In each individual case it becomes a more or less tailor-made installation.

However, the contractor or person making the recommendations must provide the following information. It can be secured by making a general survey of the area to be protected.

1. *Type of Area*—indoor or outdoor; large or small; concentrated or spread out (that is: a single building or multiple buildings). The choice of equipment, light fence pattern and beam range depend on this.

2. *Protective Range*—Must the saboteur get in close to do the damage, or can he be equally as effective at a distance? The actual location of the units hinge on this.

3. *Type of Terrain*—The profile of the ground must be carefully considered in outdoor installations. Sharp ground rises would intercept long light beams.

The photoelectric cell is finding its niche in industrial plant protection. Now, with the aid of the infra red beam, it joins the ranks of the unseen, projecting invisible fences to supplement the familiar protective systems for our war plants.

By A. E. Eidam, *Chief Engineer, Worner Products Corp., Chicago*

PROTECTION

Beam ranges depend upon the ground profile.

4. *Method of Trespass*—Careful consideration must be given to the probable method of trespass, such as scaling a wall or other means. The most probable method of approach will determine the height at which the light beam must be placed to be effective.

5. *Present Protective Systems*—The present protective systems of the plant should be carefully analyzed. Photoelectric anti-sabotage equipment is often used to supplement existing systems such as electric fences, closed foil systems and others.

6. *The Guard Patrol*—The photoelectric invisible fence is frequently used to help protect the lives of the guard patrol; also as a means of signalling a trespass alarm to a central guard house.

7. *Alarm Center*—It is important to determine who is to receive the signal. In some cases it is the watchman; or it may be a central executive office, central control room or perhaps a station of the regular law enforcement agencies.

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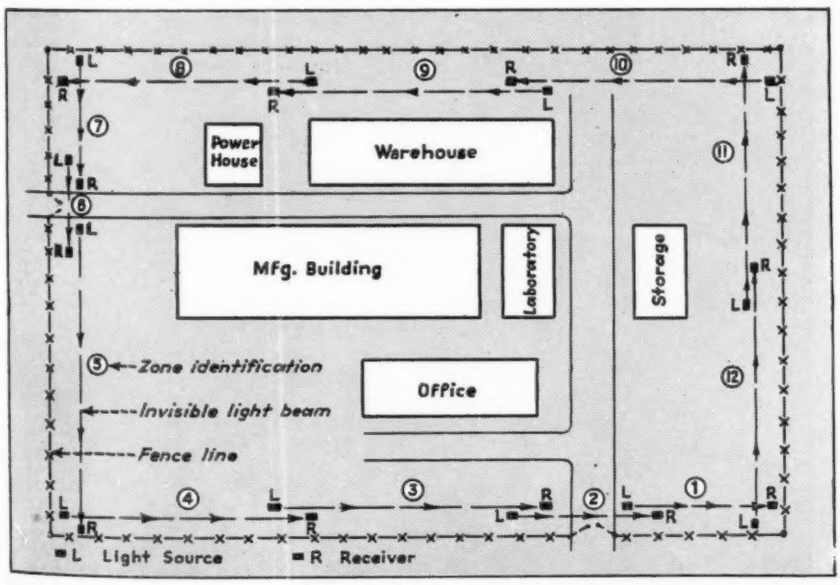


FIG. 2. MULTI-BUILDING PROTECTION *is provided by beams which run parallel to fence. Independent beams are used at gate entrances. Circuits are definitely zoned to show the plant area being trespassed when a beam is interrupted.*

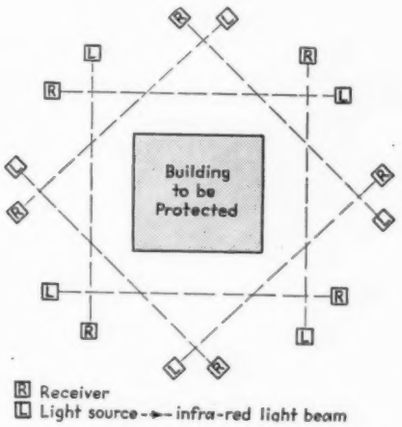


FIG. 1. DOUBLE BEAM *protection of a single building. The area is protected by two encompassing light beams. If one set of units is tampered with, the others still provide protection.*

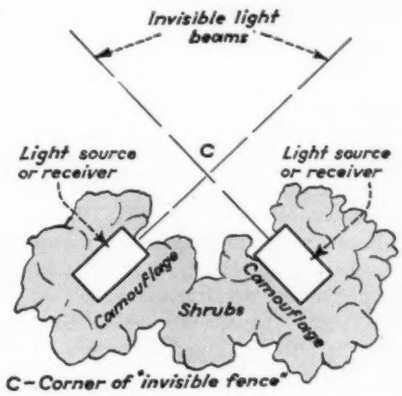


FIG. 3. CAMOUFLAGE OF UNITS *may be accomplished by concealing them in an orderly shrub arrangement. Corner of invisible fence is at "C" where the two light beams intersect.*

FIG. 4. INDOOR PROTECTION *of a single room is provided by one set of units and special focusing mirrors which direct the light beam around the room. Beam can be made to criss-cross as often as necessary for full coverage of the area. (right)*

MAINTAINING Electric

An operator adjusting the brushes while servicing the tilt motor on the truck.

Tilt motor is removed from the trucks for inspection and servicing.

THE battery-powered industrial truck, possibly because of its ability to operate longer without proper maintenance than most similar equipment, is often neglected to the point where its normal span of usefulness is seriously impaired, before it is finally inspected and overhauled.

Regular inspection and overhauling are the only positive guarantees of the continuous, efficient performance demanded by the 24-hour-a-day, 7-day-a-week production schedules now so common.

The following suggestions are to facilitate in the care and maintenance of the electrical system of this equipment.

General Precautions

The batteries, sole source of propulsive energy, should be inspected and serviced at regular intervals, according to the recommendations of the battery manufacturers, and replacements made without delay.

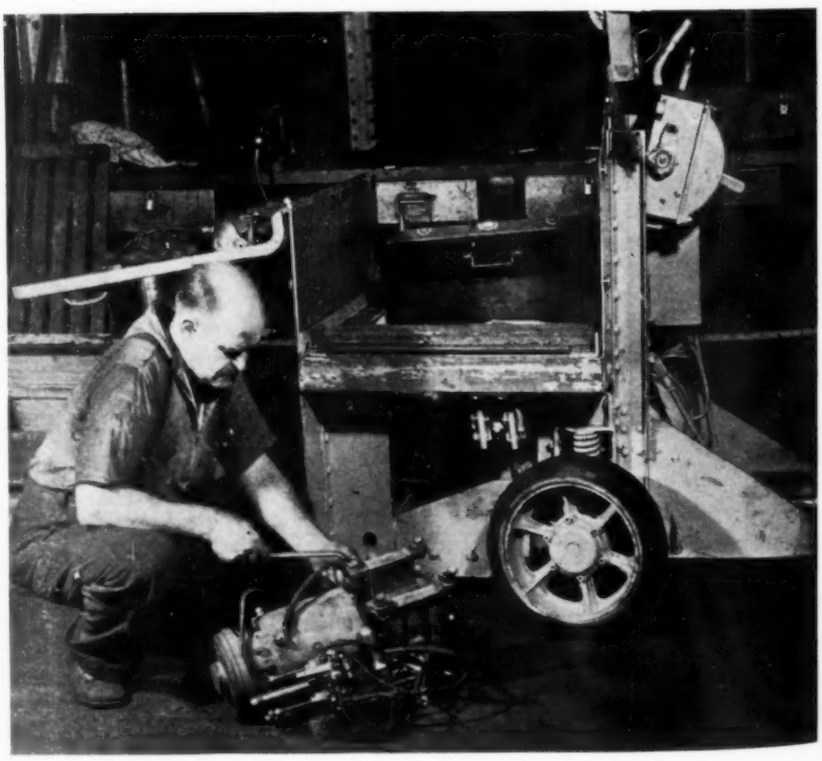
Both the traction motor, which propels the truck, and the hoist motor, which drives the pump on trucks equipped with hydraulically operated hoist and tilt mechanisms, or the gear box on gear or chain drive hoist and tilt mechanisms, should be inspected monthly and overhauled approximately once a year.

The controller, the commutator, the contactor, the accelerating resistor and all allied parts should also be inspected and overhauled at like intervals.

Here is a suggested procedure to follow:

Traction Motor—Monthly Inspection

1. Remove dirt from commutator cover and surrounding parts to prevent it from falling into the motor.
2. Remove commutator cover and examine mechanism, noting that copper surface has a smooth polished appearance and is free of copper beads and grease.
3. See that the brush-holder mechanisms seat on brushes and that shunts and terminals are tight.



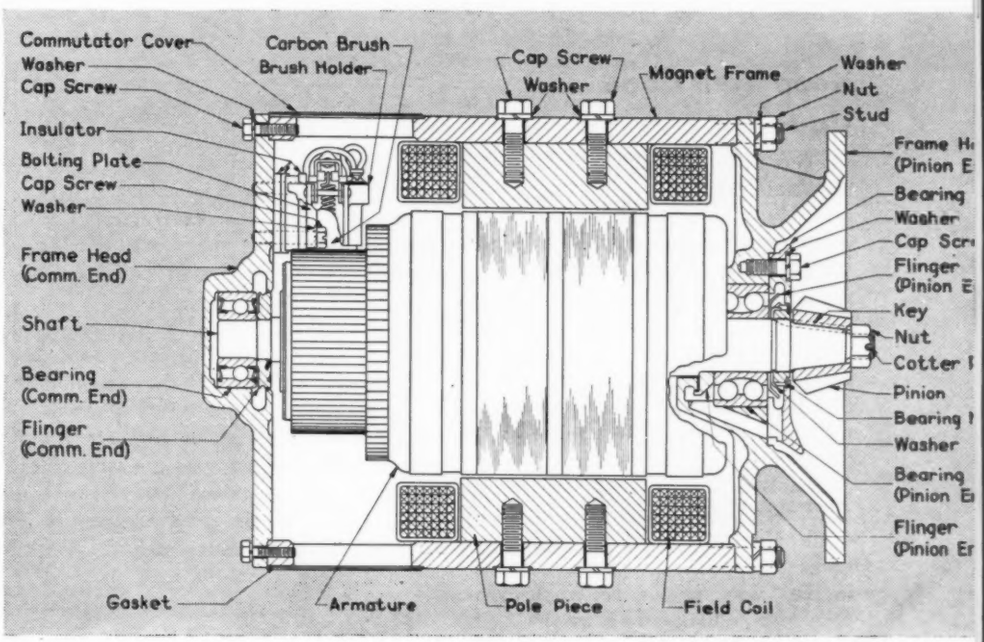
Step-by-step suggestions for the routine inspection and maintenance of battery-powered industrial trucks.

Industrial Trucks

4. Wipe carbon dust from cables and brush holders.
5. Remove dirt from brushes by lifting springs and raising and lowering brushes in the carbon ways. Do not snap the springs, as this may chip the brushes.
6. Replace short or broken brushes with new ones of the proper grade. If only partial replacement is made, grind new brushes to same length as the other brushes in the motor.
7. Inspect connections for tightness.
8. Examine the interior of motor for charred or broken insulation or other injuries and replace damaged parts.
9. Replace commutator cover.

Traction Motor—Annual overhauling

1. Remove motor from truck and clean outside of it.
2. Remove commutator cover and raise the brushes from the commutator to avoid damaging them.
3. Remove the nuts from the studs at the pinion end of motor and withdraw the armature complete with commutator-end bearing assembly and pinion end framehead assembly through pinion end.
4. Remove the pinion end framehead assembly and commutator-end bearing assembly from armature, employing suitable puller.
5. Blow out dust and dirt from armature, using clean dry compressed air and wipe clean of oil and grease with a cloth saturated with carbon tetrachloride.
6. If armature is found in good condition, proceed as follows:
7. Bake at least 12 hours at 120 C (250 F).
8. While hot, paint with a varnish such as Glyptal No. 1201. Paint the string beads but take care to keep the commutator clean.
9. Bake for twelve hours at 120 C (250 F).
10. Take out the cap screws at the commutator end and remove the framehead.
11. Blow out the interior of motor with clean dry compressed air and wipe clean of any oil and grease with carbon tetrachloride.
12. If field coils are tight and in good condition, paint them with varnish such as Glyptal No. 1201. Also, paint the interior of the motor with varnish, using care not to get any varnish on the pole-piece faces.



A sectional view of a G-E 1226-A traction motor.

Otherwise, remove field coil as follows: Disconnect the cables and remove the cap screws holding field piece to frame. Then slide out the pole and coil through end of frame and slip coil off pole. Keep each pole, coil and any accompanying shims together. Upon reassembly, parts should be returned to their original position, use new lock washers with pole-piece cap screws, make sure that contact surfaces are clean, cables are properly reconnected and cap screws drawn up tightly. Check the coil polarity. Guard against loose connections at all times.

13. Remove dust and dirt from brush holders and cables with carbon tetrachloride.
14. Note that brush holder mechanisms operate properly; that brushes are free in carbon ways; that shunts and terminals are tight and that carbon ways are not rough or worn. Brushes should never be allowed to wear so short that the pressure arm of the lever rests on the top of the brush-holder carbon way instead of on top of the brush. All brushes must have the same length to obtain an even distribution of current. (NOTE: New brushes may be fitted to the commutator brush holder by placing a strip of fine sandpaper between the end of the brush and the commutator with the rough side of the sandpaper against the brush.)
15. Pole-piece cap screws must be tight and locked with lock washers.
16. Reassemble parts on armature. When replacing bearings, use a suitable brass sleeve so that the pressure will be on the inner race of the bearings.
17. Reassemble armature in frame, putting in new brushes if necessary.

Commutator

The commutator should never be lubricated since the brushes contain sufficient lubrication. A dirty and greasy commutator will collect carbon dust in the grooves between the segments. This condition will cause a short circuit. The commutator should be kept smooth and concentric with the armature bearings. If the commutator brush surface should become rough, burned, pitted or excessively worn, the armature should be placed in a lathe and the copper turned down just enough to give a true surface. The mica between

[Continued on Page 52]

Editorials

Keep Your Code Up-to-Date

There will be no 1943 edition of the National Electrical Code and that will probably hold for the duration of the war. Instead, Interim Amendments are being and will be made and Supplements issued during the emergency period.

Our job now, is to keep our own code books up-to-date. The International Association of Electrical Inspectors have simplified this chore by issuing Part 2 of the September 1942 issue News Bulletin—a pamphlet covering all Interim Amendments to the 1940 Code plus latest Official Interpretations. These are arranged in the order of the Code sections, set in the same type and column width as the Code, and are printed on one side of the page only so they may be cut out and pasted in the Code book at the section referred to.

A dime's worth of paste and about an hour's time will bring your present copy of the 1940 Code up to date. There'll be no need for fumbling for that lost supplement or making numerous cross references between it and the 1940 Code. Everything will be at finger-tip reach. If you don't have Part 2 you can get a copy for a dime at the IAEI headquarters in Chicago. Let's bring our Codes up to date now, before we lose valuable time hunting for the latest rules.

No Rubber Covered Neutrals

There is still some confusion evident in the industry concerning the use of a neutral conductor with other than rubber insulation. Two actions by separate bodies have established new rules for grounded neutral insulation. In an order relating to the specifications for rubber insulation, the War Production Board ordered that rubber shall not be used as insulation on a grounded neutral conductor. A parallel action by the Emergency Committee amended the Code to allow weatherproof insulation on grounded neutral conductors.

The WPB rule is mandatory. Rubber insulated neutrals must not be used. However, the Code rule simply permits certain insulations other than rubber. Where conductors are made up into cable assemblies the same rules apply. Several cables with non-rubber insulated neutrals are available.

Hazards Are Ahead

Emergency substitutes in the materials and methods of electrical wiring and equipment will increase life and fire hazards. No amount of cheery optimism is going to alter that simple fact. We must admit it and what is more important we have got to face and accept the grave responsibility that goes with it.

In reporting to the members of IAEI, Secretary Victor H. Tousley voiced the same warning. He said he had been criticized for it. But anything less frank would be shutting our eyes to reality. Under the stress of material shortage and the pressure to get our production might in action, there had to be some compromise with rigid standards of safety. The electrical industry has sought to make substitutes the safest possible. Judgments as to hazards have been scaled down a little finer. Rules pertaining to permanence have been relaxed to permit conditions of accelerated aging, allowing temporary overloading on the basis that the war will be over and the immediate importance of the equipment reduced before real hazards appear.

Some substitutes will prove to have exceptional qualities, superior perhaps to conventional methods and products. Others will be used only until we can have something better. The broad average, we can be sure, will fall materially below our normal standards of safety and adequacy.

And so in every community there ought to be a record of all work done under emergency conditions, a record that will become, automatically, a warning tag when the war is over. A logical place for the record is the files of the electrical inspector gathered through industry wide cooperation.

Salvaging Waste Light

The effect of ceiling and wall finish on lighting systems has been discussed many times. The reflection characteristics of the painted surfaces is an important factor in establishing the coefficient of utilization. Last month an exceptionally complete study of the paint-light relationship was discussed by Arthur A. Brainerd, Philadelphia Electric Co., and Robert A. Massey, E. I. du Pont de Nemours before the I.E.S. in St. Louis. They brought out some remarkable facts, fully substantiated by practical lighting installations, among which was the statement that coefficients of utilization in excess of 100 per cent were entirely feasible.

The Brainerd-Massey work involves one of our most pressing problems today, to provide the most efficient working conditions with the least expenditure of critical materials. It shows us how to get more light out of "bare bones" systems. It salvages valuable waste light and puts it to work.

Do Civilian Skills Count?

Many electricians, utility repairmen, electrical draftsmen and other skilled men in the electrical construction and maintenance industry are wondering if their special abilities will count in Army life. Those about to be inducted under Selective Service want to know what branch of the service can use them most effectively.

One answer comes from the Quartermaster Corps. They report that classification and assignment of new soldiers is in the hands of carefully trained personnel officers. Through tests and interviews, every effort is made to place the individual where he can take the most effective part in the war effort.

A selectee has the right to request assignment to any branch or service that he may desire, and many men who have followed a skilled trade at home are now performing variations of their old jobs as members of the Quartermaster Corps, which offers as great a number of special trades comparable with civilian life as any branch of the service.

Closer Wire Spacings

A new interim amendment to the code permits closer spacing of 440-volt conductors installed open on insulators. Special types of insulators for feeder lines have appeared which support the wires in an equidistant triangular pattern contributing to balancing impedance on three phase power circuits. Considering the impedance of widely separated conductors and the urgent need to conserve all possible copper capacity, this is a wise move.

Plan for Maintenance

In these days every lumen that can be put to useful work has a job to do. The best lighting system is none too good for the kind of industrial schedules and seeing tasks that must be served. One of the methods that contributes materially to light output is regular cleaning, dusting and relamping, a comprehensive scheme of maintenance.

One of the important difficulties encountered in setting up maintenance schedules, however, is so obvious that it is too often ignored. The design and installation of lighting jobs too rarely anticipates the maintenance work that must be done. If the layout is arranged so that relamping is possible, the design responsibility seems to end.

But lighting systems exist for only one purpose, to provide illumination. The design and installation involve certain values of light based upon the characteristics of the equipment, its spacing and surrounding. The maintenance factor assumed in the design obviously anticipates that average care will be provided. It is logical, therefore, that provisions for maintenance should have the benefit of a real plan developed in coordination with the installation.

Sometimes this will mean lowering devices for high bay units, a simple scaffold to be carried on a crane, a rolling crows nest, demountable units or some other methods or aids to regular services. The important point is that the maintenance be correlated with the design and installation in such a way that there is planned accessibility which can be efficiently adapted to a routine maintenance schedule.

Industrial Blackouts Here

In many areas test air raid alerts have been held without requiring the blacking out of important war plants. Extensive blackout work may require a large amount of critical materials and WPB has warned that they will not grant requests until after consultation with the Resources Protection Board. Precautions which do not involve critical materials are, however, strongly urged.

Silver for Busbars

An announcement last month by Harvey A. Anderson, Chief of the Conservation and Substitutes Branch of the War Production Board has gone far to clear up questions regarding progress in the use of Treasury silver as busbars in war production plants.

Twenty-four million pounds of copper have been saved in recent months by substituting silver for copper in plants where heavy conductors are needed. Large busbars, heavy transformer windings and similar uses are arranged with the stipulation that the silver can be used only for non-consuming purposes.

A minimum of 34,000 tons has been allotted to the Defense Plant Corporation and must be returned after the war. The Defense Plant Corporation is loaning it to plants which need large quantities for operation, that can conveniently protect the silver and that are in operation almost constantly, such as plants producing magnesium, aluminum, graphite and synthetic phenol.

In view of the tremendous legal complexities surrounding the use of monetary base silver, the action of the War Production Board in putting large quantities to work for war production as electrical conductors is a notable achievement.

Back Talk

Air Raid Restoration

An outline of British practices in restoring electrical service in plants damaged by air raids appeared in the Industrial Electrification Section of Electrical Contracting last month. It was the most detailed and complete article that could be presented within the scope of censorship restrictions at this time. Many types of damage from hard British experience were revealed, giving us a valuable frame of reference to guide our plans for quick restoration and repair. The article was widely discussed and some typical comments are quoted here.

To the Editor—"I have read 'Air Raid Restoration' which is appearing in the current issue of Electrical Contracting and it is my opinion that the information contained therein is of special value to all electrical installation and maintenance men. I feel that we are all very much indebted to you for making such information available at this time."

Robert W. McChesney, Pres.
National Electrical Contractors Ass'n.

To the Editor—"I think the article relative to restoration of industrial operations in England, is a very real contribution to problems which may arise in this country. We are organizing an Electrical Industry War Damage Committee, through which we hope to make available a coordinated service of all branches in case of an air raid. The material in your article will be of real help to us in this effort."

J. S. Bartlett,
Managing Director,
The Electric Institute of Washington.

To the Editor—"The article on Air Raid Restoration contains a lot of common sense advice for all of us who may have to deal with such 'incidents' in this country. God forbid that we shall be subjected to the same ordeal which the British have had to go through. How they managed to keep so much production going in the face of air attacks is an inspiration."

William A. Ritt, Secy-Manager,
Minnesota Electrical Council, Inc.

To the Editor—"This is a very fine contribution to the cause and I am sure it contains much information that will be of value to those responsible for restoration of operations that might be disrupted due to air raids.

"At the League Conference held in Cleveland recently, quite a number of the organizations represented reported on what they were doing to aid in coordinating facilities to meet situations such as are covered in your article. Perhaps the best to date is the operation that has been set up by the Electrical Association of Rochester, Inc."

O. C. Small, Manager,
National Electrical Manufacturers Ass'n.

Methods

BRIEF ARTICLES about practical methods of installing and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

JIG FOR TAPPING HOLES

WIRING

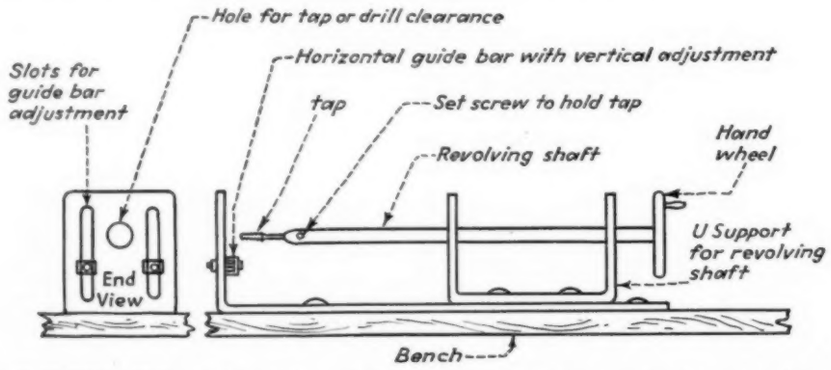
Up in Duluth, Minn., the Arrowhead Electric Co., is wiring new ships for the Coast Guard. In marine wiring all cables are supported on special brackets on which are mounted the various types of cable straps. In most cases these brackets are drilled and tapped to accommodate the cable straps. This means tapping thousands of these brackets in the job shop.

To expedite this seemingly small but important detail in the wiring of the ships, the Arrowhead Electric Company developed a jig for tapping the numerous holes. It consisted of a piece of flat iron, in the shape of an "L", about 4-in. wide, 12-in. long and approximately 5-in. high at the foot of the "L". This foot contained two long vertical slots which accommodated the fastening bolts of an adjustable horizontal guide bar which can be raised or lowered as occasion demands. The brackets rested on this bar while being tapped. A comparatively large hole drilled midway between the guide bar slots and in direct line with the tap holder gives clearance for the tap.

The tap holder is a solid steel shaft supported by a "U" shaped piece of flat iron the same width as the "L" bracket. The holes through which the shaft passes are a comparatively tight fit to eliminate either vertical or horizontal sway of the tap while in operation. The shaft is oiled to permit it to revolve freely and move back and forward as the tap is engaged or disengaged from the work. One end of this shaft is drilled and equipped with a set screw to hold the tap. A key wrench tightens or loosens the set screw. The other end of the shaft is equipped with a hand wheel to slowly turn the tap. The complete jig is mounted to the work bench near the drill press, so the drilling and tapping operations can be done with the least amount of lost time.

The men using this jig list the following advantages: holes can be tapped faster than with the hand tap wrench; holes can be tapped more accurately; fewer taps are broken due to the elimination of bending stresses; the hand wheel on the revolving shaft provides strong even leverage.

This device is another example of the many and varied methods applied to expedite war contracts.



***TAPPING JIG** speeds tapping of holes in cable supports and other mounting accessories; increases accuracy of work and reduces breakage to a minimum. Unit is simple and inexpensive to build and is a valuable asset to any contractor's job shop.*

CHECK POINTS FOR SERVICING LIGHTING EQUIPMENT

INDUSTRIAL

Greater efficiency resulting in lower operating costs and better performance are some of the direct benefits of a complete inspection and maintenance program for fluorescent and incandescent lighting.

Luminaires should be cleaned regularly and frequently. Illumination can be reduced as much as 50 percent if dust and dirt is allowed to accumulate on reflecting surfaces and lamps. Dirt not only reduces light output on concentrating high bay reflectors, but alters the light distribution.

***CLEANING REFLECTORS** with soap and water at scheduled intervals improves efficiency of industrial incandescent lighting equipment.*

***IMMEDIATE REPLACEMENT** of fluorescent tubes that are burned out or beyond normal operating life insures efficient operation.*

When lamps fail they should be replaced immediately with proper size and type. Many large plants have a relamping crew patrolling the plant regularly. Fluorescent lamps should be replaced when they start to flicker in order to protect starter and ballast.

Filament lamps should operate at rated voltage marked on bulb for most efficient lighting. Socket voltage below rated value will reduce light output in ratio of about 3:1 in reduced voltage.

● The men who supply and install electrical equipment in war plants play a role in the victory effort that is too often underestimated. *These men and these men's work are basic to war production* and their good judgment in selecting equipment that goes into factories can make a tremendous difference in production totals. That is why experienced and capable electrical wholesalers and contractors insist on safety switches that have proved their dependability in countless Production for Victory plants. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

CUTLER-HAMMER SAFETY SWITCHES

For Hazardous Locations

Class 1, Group D. For Explosives Factories, Gasoline Refineries, Chemical Plants . . . wherever volatile or highly flammable substances are manufactured, handled or stored. Single throw and double throw, 2, 3, and 4 pole types.

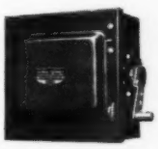
Dust Tight—Weather Resisting

Class II, Group G. For Grain Elevators, Cement Plants, Coal Handling, Powder Plants—wherever explosive, corrosive or conductive dust is present in quantities or where switches are exposed to the weather.

General Purpose

Type A, (Heavy Duty). For heavy duty service in Armament Plants, Textile Mills, Steel Mills, Metal Working Plants—wherever heavy loads are encountered—and continued operation vital.

Compact Design



Type A, (Heavy Duty). For severe service and limited space. Compact, efficient, heavy duty switch. Ideal for many applications in Armament Plants, Machine Tools, Textile Plants, etc.

Regular Duty

Type C. For Metal Working, Moulding, Machine Tools, Food Industries, Industrial and Commercial Buildings, etc., where a high quality, efficient motor circuit or disconnect switch is required.

Industrial Duty Multi-Breakers

For Machine Tools, Armament Plants, Metal Working, Textile Machines, etc. Proven operation and protection. Ideal where production cannot permit blown fuse interruptions. Service restored by simple reset lever.

CUTLER-HAMMER
SAFETY SWITCHES
C-H

1892-1942 50th ANNIVERSARY

Methods

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A higher voltage will increase light output but greatly reduce life of bulb. Periodic checks should be made to insure maximum lamp operating efficiency.

DOUBLE-DECK CONDUIT TEMPLATES

WIRING

Thousands of large conduits in three-foot floor slabs had to be accurately spotted at cubicle locations at the Ford Bomber Plant. Since these thick slabs are poured in layers as each tier of conduits was installed, rigidity of the riser nipples was of paramount importance. Any movement that would misalign the conduit stubs in the finished floor would cause considerable trouble when the switch cubicles were set.

To assure perfect alignment the John Miller Electric Co., Detroit electrical contractors on the job, used carefully designed and rigidly braced templates. Where conditions warranted, these templates were of a doubledeck, step type, rigidly supported from the floor, ceiling and walls.

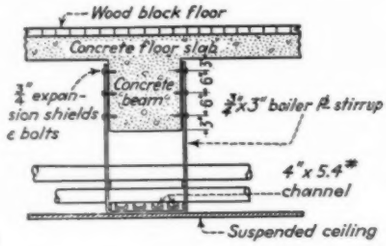
Such an arrangement is shown in the accompanying photograph. The heavy planks forming the template were accurately drilled to receive the conduit risers. Vertical adjustment of the plank templates was accomplished by turning the pipe legs supporting them. These "legs" went through the planks and were threaded into the underside of floor flanges mounted to the top of the planks. Long threads on the pipe legs permitted adjustment. Vertical braces and wedges from the ceiling and side braces kept the templates from "floating" when the slab layers were poured.

DOUBLE STIRRUP FOR CONDUIT SUSPENSION

WIRING

A double stirrup support for tiers of heavy conduit in either open or hung ceiling locations is used in some of the industrial structures and buildings designed by Albert Kahn Associated Architects and Engineers, Inc., Detroit, Mich.

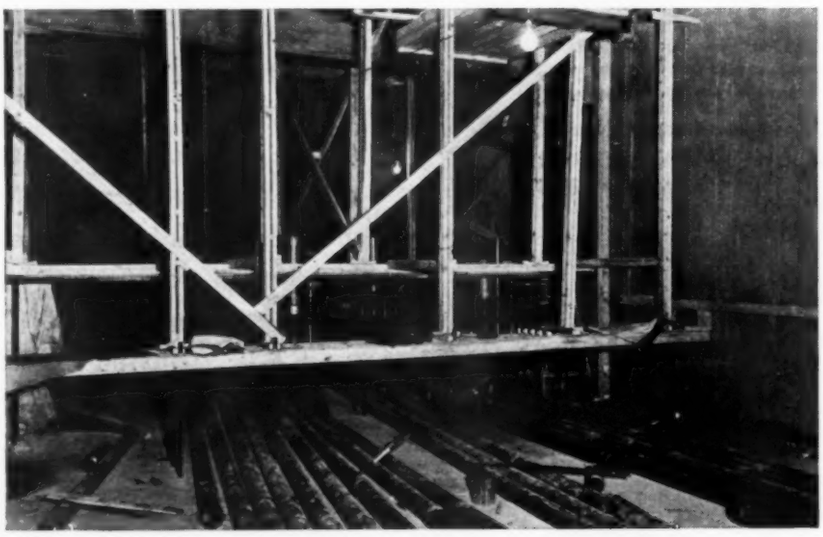
In the accompanying sketch, the concrete beam is the supporting member. The sides of the ¼-in. by 3-in. boiler plate stirrups are bolted to the sides of the concrete beam, the span of the stirrup corresponding to the beam width. The distance from the bottom of the beam to the bottom of the stirrup varies, depending upon the number of tiers of conduits to be installed.



STIRRUP HANGER assemblies support tiers of heavy conduits suspended from an open or in a suspended ceiling. Actual dimensions of hanger and its component parts depend upon the conduit load to be supported.

The stirrups support a number of 4-in. by 5.4 lb. channels on which the first layer of conduits rest. The length of the channels depend upon the number of conduits per layer. Additional tiers of conduits rest on flat iron spacers welded or bolted to the stirrup sides.

If a hung ceiling is installed it is secured to the bottom of the stirrups where conduit runs are located.



***NOT A PAINTER'S SCAFFOLD,** but a double-deck wood template for underfloor conduits entering switch cubicles. Elaborately braced templates of this type assured perfect alignment of conduits after the slab was poured. Note the men working under the templates.*

***COMBINATION CONTROL PANEL** directs the operation of motors at the sewage plant of the Ford Bomber Plant. Combination disconnect and magnetic switches for the motor circuits are mounted semi-flush in rows on one-half of the panel. The other half encloses the feeder and sub-feeder circuit protection making a dead front control board. Semi-flush arrangement of motor switches permits front-of-board maintenance.*

TAPING SYNTHETIC AND V. C. SPLICES

WIRING

A question that frequently arises is the taping of joints in conductors having either synthetic or varnished cambric insulation. How should these joints be insulated? E. B. Paxton, General Electric Co., Schenectady, N. Y., in a letter to the IAEI, suggests the following methods:

For varnish cambric—the best splice is obtained by the following procedure:

1. Apply varnish cambric tape over the individual conductors.
2. Then make an overall application of friction tape and paint it.
3. To secure moisture resistance—apply rubber tape overall—on top of the

GOOD LIGHTING

Gets Them to the Fighting Front

FASTER!

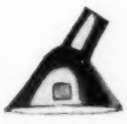
★ The job of supplying our fighting forces with an endless stream of airplanes, ships, tanks, guns and ammunition must not falter. Any plant improvement that will speed production . . . get more output from available skilled workers . . . is both a patriotic duty and a sound investment.

Good lighting is a first essential in maintaining worker efficiency and morale. It helps good eyes do more work more accurately. It enables older workmen to perform tasks that otherwise are beyond the capabilities of their dimming vision.

Adequate lighting—directed for maximum efficiency and energy conservation depends to a large degree upon the basic design and construction of the lighting equipment. Play safe by specifying lighting fixtures bearing the RLM LABEL. This label is your assurance that the fixtures so identified have been tested by Electrical Testing Laboratories; are certified by this independent organization to meet rigid specifications essential to high efficiency, economical operation and maintenance, and ability to withstand vibration and heavy duty service.

Only Industrial Lighting Units built to exacting RLM Specifications are permitted to carry the RLM LABEL. Write for complete set of RLM Specifications, and booklet, "The Meaning of the RLM LABEL".


RLM Silvered Bowl Diffuser


RLM Symmetrical Angle Reflector


RLM Deep Bowl Reflector


RLM Dome Reflector

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

307 N. MICHIGAN AVE. SUITE 1500 · CHICAGO, ILL.

Methods

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friction tape; apply another layer of friction tape and paint.

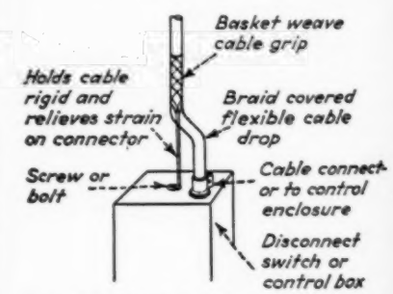
For synthetic insulated conductors—the best field practice on type SN insulation has been the conventional use of rubber and friction tape the same as on rubber insulated conductors. The factory methods of using molds and synthetic insulation requires accurate temperature control and is not applicable to field practice.

FLEXIBLE CABLE GRIP

WIRING

In a number of the nation's war plants where different types of busway are being used for electrical distribution to the production machines, flexible cable drops are replacing the conventional conduit drops from the busway circuit protector to the motor control on the machine. To keep these cable drops straight and neat looking, spring attachments and sometimes counter weights are employed.

Such necessary attachments put an added strain on the cable, especially at

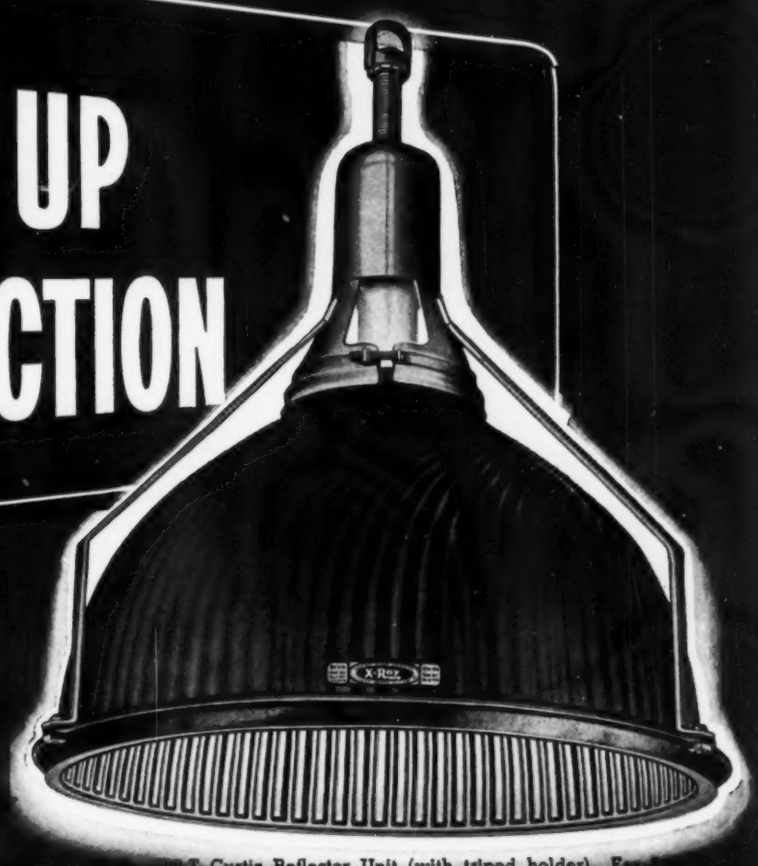


***ANTI-STRAIN GRIP**, similar to conventional cable baskets, produces offset in flexible cable machine drops and relieves strain on cable connector at entrance to switch or control enclosure.*

the connector where it enters the control enclosure. To eliminate this strain and reduce the chances of the cable pulling out of the enclosure, the Associated Electric Construction Company, Melrose Park, Ill., used a basket weave cable grip on the flexible drops to hundreds of machines in a war plant it recently wired.

The grip is similar to the wire cable baskets used for pulling cables into raceways. It is of proper size to fit over the cable drops used and the gripping portion is about four inches long. The grip is slid over the cable end before it is inserted in the box connector. Once the connection is made

STEP UP PRODUCTION



T Curtis Reflector Unit (with tripod holder).

No. 1589 Curtis Reflector Unit (with metal housing).

No. 589 Curtis Reflector Unit with socket and holder.

To knock the spots out of spotty production WAR INDUSTRIES NEED THESE REFLECTORS

Here's an immediate opportunity to STEP UP LIGHTING, to increase working capacity, make production levels uniform. . . .

STEP UP SPEED of layout, delivery, and installation by specifying "X-Ray" Silver Mirror Reflectors. They use a *minimum amount of critical materials* and have been the standard of lighting quality for over 40 years. They are easy to maintain, and not subject to deterioration.

STEP UP EASE OF SEEING with these remarkable new Curtis industrial units with their exceptionally high percentage of useful light.

The new Curtis industrial units shown here are right now "going great guns." More and more possibilities for their use are opening up around you every day. If you haven't full information about them—write for it now.

CURTIS LIGHTING, INC.

6135 W. 65TH STREET.....CHICAGO

Methods

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the grip is bolted by a wire extension to the top of the control box about two inches away from the cable entrance. Sufficient tension is applied to make an offset in the cable drop and to relieve all tension on the cable connector.

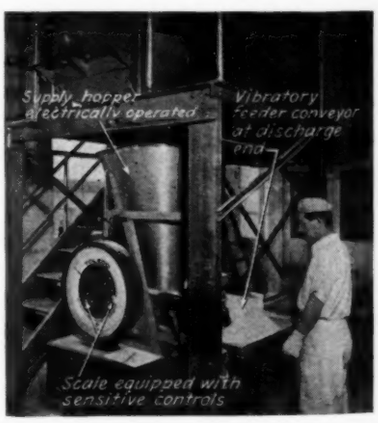
In cases where the controls are too small to afford anchorage for the cable grip, it can be anchored to the machine; or—where conditions require side entrance to motors or controls near the floor level, the grip can be fastened to the floor. A few turns of wire or tape between the upper edge of the grip and the cable will insure against its slipping.

Many maintenance headaches and production interruptions, due to accidental strains or "yanks" on machine cable connections, can be avoided by the use of this simple device.

ELECTRICAL VIBRATION INCREASES PRODUCTION

INDUSTRIAL

In many plants vibration is a hazard that tends to mar the efficiency of operation. Not so for the Emerson Drug Company of Baltimore. Electric vibration is used to advantage in the manufacture of their nationally known product, Bromo-Seltzer.



FULLY AUTOMATIC, this vibration equipment has speeded production of Bromo-Seltzer.

The entire contents of the large stainless steel supply hopper is electrically vibrated to insure a free-flowing operation. A vibratory feeder (Syntron) controls the flow at the discharge end which is interconnected electrically to a weighing scale. The scale actuates very sensitive controls that eases the flow

Each Roll of
PANTHER and DRAGON TAPE
Contains Guaranteed Footage

Because of manufacturing tolerances, slight variations in weight may occur in any roll of tape. *With PANTHER and DRAGON Tapes this does not affect the footage,* which is actually measured as the tape is wound on the roll.

Whether or not tape is sold by the roll, or by the pound, is unimportant so long as the unit purchased contains a specific and guaranteed number of feet – sufficient to provide a given amount of "coverage"–and meets the requirements of the industry's specifications.

In addition, the dealer and his customer want quality. You can be certain of this with PANTHER and DRAGON Tapes because they meet the quality requirements of the latest U. S. Navy and Federal specifications.

HAZARD INSULATED WIRE WORKS
Division of the Okonite Company

Wilkes-Barre, Pennsylvania • Offices in Principal Cities

PANTHER and DRAGON
Friction and Rubber Tapes

ARMY E NAVY

"BUY U. S. WAR BONDS... Every Payday All Hazard Employees BUY U. S. WAR BONDS"

Methods

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and cuts it off at the right point. Besides increasing production, a 40 per cent saving in cost on the operation is reported. The vibrator is entirely noiseless.

TIME STUDY OF PIPEFITTING COSTS

INDUSTRIAL

An incentive plan of benefit to both management and men is used to control pipefitting costs. It is a measurement system devised by Westinghouse whereby all of the time valves for pipefitting can be compiled in chart and curve form for computation and application.

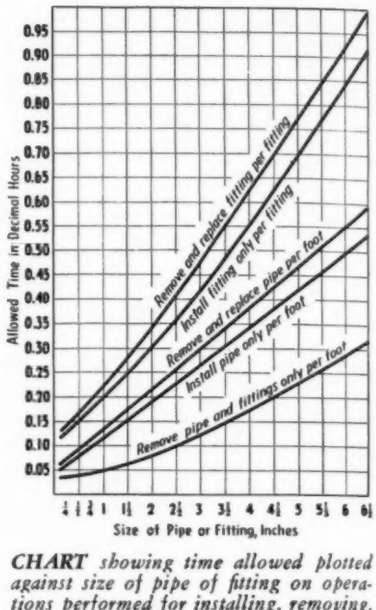
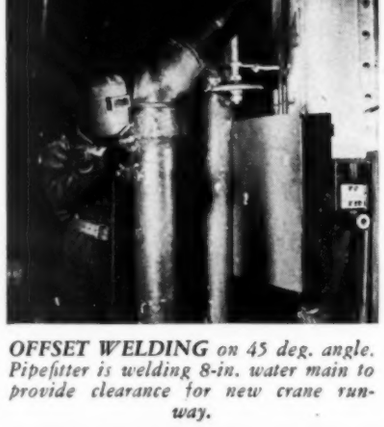


***CHART** showing time allowed plotted against size of pipe of fitting on operations performed for installing, removing, replacing pipes when installing or repairing pipelines overhead.*

Standard methods of performing work were formulated after extensive time studies were taken. Hydraulic, standard, and cast iron pipe had a decided effect on the cutting, welding and threading time due to the various thicknesses and a slight influence on the handling time due to the variance in weight.

Other time studies were compiled for factors such as diameter and length of pipe; type of fitting; location; type, size and gauge of bends; outdoor weather conditions; and amount of removal of old pipes. To all time computed from the charts is added the set-up time for collecting tools, and moving to the job as well as time required on part of the group leader for supervision and time keeping standpoint.



***OFFSET WELDING** on 45 deg. angle. Pipefitter is welding 8-in. water main to provide clearance for new crane runway.*

***PORTABLE** pipe equipment such as pipe machine, tool box to expedite work at point of installation.*

VARNISHED CAMBRIC · RUBBER POWER CABLES · BUILDING WIRE · RADIO WIRES · SIGNAL CABLE · FLEXIBLE CORDS · LEAD-ENCASED AND PARKWAY CABLES · ARMORED CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE · SERVICE ENTRANCE CABLE · MAGNET WIRE · BARE WIRE

CRESCENT

Heavy Duty

PERMACORD

CRESCENT PERMACORD is a tough, flexible, heavy duty, portable cord or cable that employs a minimum amount of rubber. It is permitted construction under present rubber restriction for service on portable drills and tools, mining locomotives, and welding, construction and mining machinery.

The flexible, rubber-insulated copper conductors are enclosed in a protective jacket of rubber, vulcanized to an outer cover of heavy, hard-twisted Seine twine, impregnated to be weatherproof. This construction gives maximum protection from abrasion, crushing, heat, oils and greases, and weathering. It has been used for years principally by steel plants for their most severe portable cable jobs. PERMACORD is made in sizes from #18 AWG to 1,000,000 CM, as well as in standard sizes of WELDING CABLE.

Safe—Durable—Economical

CRESCENT INSULATED WIRE & CABLE CO.

Ask Your Wholesaler For

CRESCENT
WIRE and CABLE
Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER-AGING INSULATION · WEATHER-PROOF WIRE

Methods

[FROM PAGE 46]

HEATED CARBON TIP FOR SOLDERING

INDUSTRIAL

An ingenious arrangement using an electrically heated carbon tip, for the soldering of plate-type rheostats used for motor and generator control, has greatly speeded production at one of General Electric's control factories.

A SIMPLE SET UP using an electrically heated carbon tip instead of a hand soldering iron is speeding the completion of plate-type rheostats.

The assembled rheostat plate is first placed in a grounded ratchet fixture. The carbon tip is then lowered into contact with one of the several rheostat buttons to be soldered—the button is quickly heated—the solder is applied. The plate is then rotated by a foot lever to bring other buttons into position for soldering.

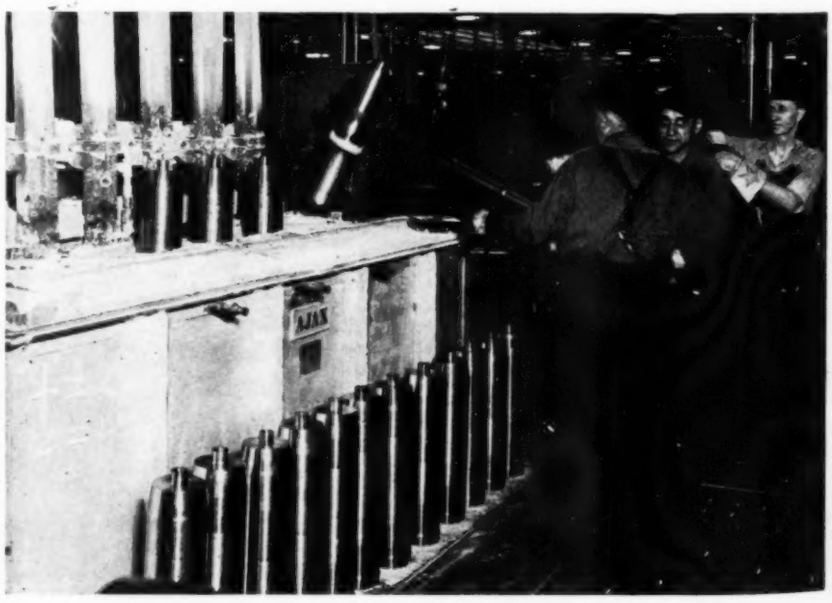
Formerly this was a completely manual operation with a hand soldering iron. The operation was slow and required a great deal of soldering iron maintenance.

ELECTRIC SALT BATH SAVES 500 F. HEAT

INDUSTRIAL

Big shell forgings at the rate of 40 an hour are being heated for nosing in each one of a large battery of Ajax-Hultgren electric salt bath furnaces at the Willys-Overland plant. Illustration shows one of the Ajax salt baths in production. The shells (high explosive 155's) are successfully heated for forging at temperatures 500 degrees lower than those usually considered necessary for this work. A molten neutral chloride salt is required, heated and held at temperature by immersed electrodes. The low forging temperature made possible by this novel heating method eliminates most of the rejects hitherto caused by eccentricity, wrinkling, linear distortion, and scale.

Shells are actually heated for a length of but nine inches, with sharp, visible demarcation between the hot and relatively cold portions. They are then inserted in the forging press which squeezes the hot nose shut and produces the familiar projectile shape. The slight salt film clinging to the shell is found to aid the operation, and it is not removed by the usual water rinse until the forging is completed.



NOTE the salt band on the shell to right, which has just been removed from the furnace.

a Check List for Wartime Transformer Buyers

Get these 5 Pyranol features and you are sure of reliable service

1. High emergency-overload capacity. The heat storage capacity of Pyranol makes Pyranol transformers ideal for emergency overloads.

2. Stamina to withstand voltage surges. High dielectric strength (inherent in liquid-filled transformers) is an extra safeguard against damage from voltage surges due to lightning or switching operations.

3. Noninflammability. You can't burn Pyranol. No Pyranol transformer has burned, or contributed to a fire. This record, covering 10 years of operating experience, fully justifies the recognition accorded Pyranol transformers by the National Electrical Code.

4. Virtual freedom from maintenance. The efficiency and life of Pyranol transformers do not depend on frequent cleanings and other attention. Pyranol is nonoxidizing and nonsludging. Under normal operating conditions it will maintain its insulating properties through years of service.

5. Protection against moisture and dirt. The pressure-tight steel tank protects vital transformer parts against moisture, dirt, dust, abrasives, and other enemies of transformer reliability.

TRANSFORMER reliability is a big factor in continuity of power supply, and that's essential to maximum war production. Pyranol units have all the features—*plus*—that have made liquid-filled transformers the most nearly trouble-free electric apparatus in service today.

Save Vital Copper, Too

An actual example of savings: One new war plant saved 30,000 pounds of copper (because of shorter runs of heavy secondary conductor) by installing Pyranol transformers indoors at load centers.

Moreover, by locating transformers near the load, you get better voltage regulation and lower line losses.

For complete information on Pyranol transformers for your requirements, consult your G-E representative. Or, write General Electric, Schenectady, N. Y.

333-kva Pyranol transformer, incorporating Spirakore design. Rated 60 cycles, 2400/4160Y volts to 240/480 volts.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

GENERAL ELECTRIC

Infra-Red Beam Plant Protection

[FROM PAGE 33]

8. *Method of Signalling*—Either visible or audible alarms or both may be used. The system may be connected to give a general alarm and also show, within 500 feet, the point of trespass. The system may also operate silent signals or "surprise floodlighting."

With the above information at hand, the problem of designing a photoelectric protective system becomes relatively simple. From the contractor's angle, the installation is easy. Each light source and receiver is supplied with 110-volt alternating current. In addition, each receiver must be connected to a pair of wires going to the central control room. All wiring on outdoor units should be underground. The units are mounted on 1½-in., pipe stanchions embedded in concrete with the height of the stanchion depending upon the specified height of the projected light beam.

Indoor Protection

Anti-sabotage photoelectric equipment for indoor protection of plant buildings embraces three different types.

The first type is for small indoor installations where only one light beam is required and reflections from special focusing mirrors are made to criss-cross the area a sufficient number of times to cover it thoroughly. No central control station is necessary and all relays, including the one which operates the alarm, are within the receiver. Such a system is provided with a lock switch and once the alarm is sounded, only the possessor of the lock switch key can shut it off.

The second type is for protection of multiple rooms, each room requiring a separate set. A central control cabinet containing alarm and room indicator relays is provided.

A third type is used where a number of units are to be installed and connected to an existing control panel. These particular units contain their own impulse relays to actuate the alarm relay on the panel.

Here again, the photoelectric protective system is used to augment existing protective schemes such as the closed circuit foil system which can be "fixed" from the inside to permit unheralded access to a building or room.

The market for this type of protection is seemingly endless at the present time. True, the larger plants have fence line lighting, guard patrols and other

[Continued on page 52]

ONE OF THE

LINE

THERM-A-TRIPS

cost little, can be instantly replaced, and have other conspicuous advantages over mechanical devices for the protection of motors and motor circuits. Their long, safe time-lag permits the uninterrupted starting and running of single motors or a series of motors under load, but they open instantly on short circuit; thus giving the fullest and most flexible protection available. Cartridge and knife-blade types, 0 to 600 amperes, 250 and 600 volts. Ask your dealer, or write for our Bulletin 405.

The Chase-Shawmut Company
Newburyport, Massachusetts
Fuse Makers Since 1893

Infra-Red Beam Plant Protection

[FROM PAGE 50]

systems. But, a number of these plants are also installing photoelectric protective systems to supplement those already mentioned. Then there are the countless number of small plants who, during the peaceful civilian era, had no need for protective systems. Now, when they are engaged in war subcontracts, it is a different story. They may not be large enough to afford an extensive guard patrol or an elaborate protective lighting system. Photoelectric protection is a natural in this case.

We could go on, mentioning numerous applications but, the market can be summed up in one sentence—"Any plant that is vital to the war program and the health and safety of the people needs adequate protection."

Electrical contractors and plant maintenance men can quickly familiarize themselves with photoelectric protective systems and make the necessary recommendations. A study of the theory and application of the photoelectric cell to plant protection and to industrial problems in general will stand these men in good stead now and during the postwar days of the future. Electronic control is a science that is finding its place in industry. The boys "in the know" on this subject can materially aid our war production on the home front now and civilian production later and, incidentally, will "cash in" in their own right.

Maintaining Electric Industrial Trucks

[FROM PAGE 35]

the copper commutator segments is undercut to $\frac{1}{64}$ in. below the copper brush surface on new commutators and should be undercut as often as necessary to prevent the mica from becoming flush with the copper brush surface. Slightly round all sharp edges on the copper segments after turning or undercutting and remove all chips, sharp edges and copper dust from the grooves between the segments. Care must be taken to prevent the copper chips and dust from lodging in the armature winding while reconditioning the commutator, by using a suitable head covering over the end windings.

Pump Motor—Inspection and overhauling

The same procedure suggested for the inspection and overhauling of the traction motor should be followed in the case of those industrial trucks equipped with a motor-driven gear-and-chain or hydraulically operated hoist and tilt mechanism, except for the differences in the method by which the motor is removed or opened.

Details vary according to the particular type of truck involved, but in general it is necessary to first disconnect the coupling between the motor and the pump. The mounting screws may be differently located, but an inspection will make it readily apparent what changes need to be made in the routine as already mentioned in connection with the traction motor.

Controller

1. Blow out all dust and grit with clean dry compressed air.
2. If required, oil contact cam rollers through holes provided insulating support and oil reverser-shaft bearing. Use an accepted lubricant in a long snout oil can.
3. Replace any broken springs or shunts and check all connections for cleanliness. Tighten if loose.
4. Inspect contact tips for cleanliness and wear and carefully remove any roughness on contact surfaces with a clean fine file. Contact tips worn halfway through should be replaced.
5. At yearly overhaul period, remove, clean and repack main shaft bearings with an accepted ball-bearing grease.
6. Both the contact tip pressure and the tip gap (distance between the tips when the contactor is open) should be checked periodically.

Contactor

The contactor should be inspected at the same time the controller is inspected as follows:

1. Use clean dry compressed air to blow out all dust and grit, being sure to blow out all metallic dust from contact points.
2. Replace any worn or broken joints.
3. If the contact tips are badly burned, dress down with a fine file. (Do not waste contact metal.) Replace tips when worn halfway through.
4. Inspect cable and shunt connections for loose or faulty electrical contact.
5. Periodically check contact tip pressure and tip gap.

NOTE. Specific information relative to coil operation and contactor adjustment should be obtained from the manufacturer.

Accelerating Resistor

1. Blow out all dust and dirt with clean dry compressed air and check all connections for tightness.
2. Check both resistor ribbon and porcelain insulator for damage or breakage.

From the foregoing, it is obvious that proper maintenance of industrial electrical trucks, eliminating expensive breakdowns and replacements, is based solely on the common-sense, but often disregarded, theory of preventing trouble before it starts. Under normal conditions of service, sound maintenance will greatly lengthen the life and usefulness of the equipment.

Industrial Electrification

ENGINEERING · INSTALLATION · MAINTENANCE

BARE BONES

DONALD NELSON warned industry a few weeks ago that it must get down to "bare bones" in buildings and equipment. There isn't enough new and up-to-date equipment to meet all the demands that ordinary planning would specify. Yet some new equipment must be used to keep the wheels turning. Operating with minimum new electrical replacements becomes an important responsibility of the men who must maintain the electrical systems of our war production machinery.

In these pages we have outlined a plan to demonstrate how a plant may meet its daily electrical maintenance requirements, be ready for ordinary emergencies and know where to turn when an important breakdown occurs. And in each case the plan accomplishes its purpose with a minimum stock of new replacement material.

No plan or program, however, can be expected to substitute for ingenuity. In the hands of skilled and experienced men, electrical maintenance will offer many serious challenges in these coming months. Makeshift methods once scorned may have to be used. New materials may have to be earmarked for only the most urgent jobs. But, above all, the planning and repair of routine maintenance or major breakdown takes skillful judgment in adapting the materials at hand.

Previous articles covered—

Eliminating Causes of Severe Service Conditions
Providing Adequate Capacity for Increased Demand
Electrifying Operations to Reduce Unit Costs
Safety Protection for Electrical Operations
Increasing Flexibility of Electrical Service
Electrical Aids to Automatic Control
Electrical Ways to Reduce Waste
How to Save Power
Protection Against Sabotage
Improving Working Conditions
Electrifying for Continuous Operation
Electrified Plant Housekeeping
Electrical Problems Under 168 Hour Schedules
Electrical Aids to Plant Conversion
Electrical Aids to Quality Control
Electrical Aids for Green Help
Codes in Wartime
Grounding for Safety
Air Raid Restoration
Operating Replacements (This Issue)

Future articles will discuss—

Wiring for Quick Changes
Blackout Control

OPERATING REPLACEMENTS

A "Salvage" Plan for the Duration

The Plan:

A—Establish the minimum stock of repair parts that will enable the plant to meet any single ORDINARY EMERGENCY. Be sure that this stock is kept in the bank (your stockroom). Tag items suitably as "E" for "emergency use only."

B—Make arrangements so that you will know where to turn for special relief in any SUPER-EMERGENCY.

C—Add a stock of repair parts to cover needs in normal operations of the plant for the period required to obtain replacements through usual trade sources. Build this stock from items D and E below, plus an absolute minimum of new materials.

D—Strip all usable parts from equipment that ordinarily would be junked and feed these parts into your repair stock as a reserve to rebuild temporary units from pieces of old ones.

E—Save and sort short lengths of wire and other odds and ends of supplies so long as these are of minimum length or quantity for practical use somewhere in maintenance work. Otherwise, sell for scrap.

F—Whenever possible draw on D and E before dipping into new material.

G—When emergency A stock is used, it must be replaced at the earliest possible moment.

H—Develop all possible ideas for temporary alternatives.

The purpose of this plan is to demonstrate how a plant may meet its daily maintenance requirements, be ready for that type of ordinary emergency which occurs with some regularity, and know where to turn in cases of super-emergency. With the plan in effect, all this will be accomplished with a minimum stock of new replacement parts and material.

The first step in the program will be a proper analysis of probably needed maintenance parts and materials. From records which have been kept of maintenance work done on each machine or plant unit, establish the frequency of breakdown, repair or maintenance.

When records have been kept, determination of the parts which most often need replacement is simple. Further determination of the interchangability of frequency replaced parts should then be established. If no record has been kept of maintenance performed, the problem is more difficult as a history record must be built up.

Consultation with various persons who have had the care of the machines will provide a rough and ready maintenance record which can serve as an indication of the material and spare

WIRE FORMERLY *junked can often be profitably sorted for usable lengths. Material shortages have made heavy stranded cable unobtainable for most new wiring.*

parts necessary. Then should be started, immediately, a record of every maintenance job performed.

Rate Equipment by Importance to Production

After the frequency of breakdown has been established, put a rating on all equipment. Rank each in order of its importance to the overall production job of the plant. Past experience will have demonstrated that in cases of simultaneous breakdown one machine must be repaired at once, while another may wait for some time before seriously delaying production. The order is to put first things first.

An example of meeting urgent necessity is that done by the Army Air Force during its early days in Africa. The brakes on six transport planes became defective. Without spares available, they were replaced by brakes taken from the first six planes in for servicing. Thus planes were kept flying by using parts from others grounded for servicing. The same principle can be applied to servicing electrical equipment.

List those machines which control the plant's ability to produce but which have no spares or have spares of less than required capacity. For example, compressors out of service may stop presses which normally supply parts to other production departments. Spare parts or units should be immediately available for such machines.

Determine for each machine its relative position in the total production program. Establish the outage frequency of the different units correlated with the effect of each upon production. List the parts which most frequently need replacement, and check those parts which are duplicated on different machines.

With this information, set up a "priority" system within the plant to insure that parts for critical units are available for maintenance when breakdown occurs. Reference to probable intervals between shut-downs will give some measure of time limits for delivery of replacement parts. Do not permit stocks of replacement parts to be used for other than emergency repairs unless it is known when these parts can be returned to stock. If using a critical part depletes the stock for maintenance of critical machines, repair of a unit having no serious relation to production should wait the receipt of the needed part from other suppliers. The merely desirable must be distinguished from the essential, so that nothing may be permitted to stop the essential units for long.

Know Your Supply Sources

Of great value is a listing, with up to date information, of the suppliers who can furnish replacement parts, and the time required to make delivery to the plant.

Delivery dates are today the most uncertain promises given. When emergencies occur, delivery is more important than price and may be even more important than quality. Have the list show all suppliers from whom an article may be secured, and also all of the substitutes which might be used in place of the standard article. When the purchasing agent has before him all of this information, he can often do an amazing job of quick procurement.

Item B in the plan suggests that arrangements be made to secure special relief in super-emergencies. Special relief means more than ability to secure from regular suppliers. Many specialty houses have built their entire business upon quick delivery in emergencies. These, however, come more nearly within the category of regular suppliers since that is their business. For special relief turn first, within the plant, to the machine shop, the casting shop, and other departments which may be able to make the part in less time than purchasing procedure might secure it. Investigate the possibility of robbing a less important unit of a part which would make a satisfactory replacement. In much dissimilar equipment there may be many identical parts. Bearings may be interchangeable. Gears may have the same dimensions. Belts may be the same length and width. Motors may be of the same size and speed. Robbing such items may keep the plant working at the expense of a relatively unimportant production or service loss.

Special relief from outside the plant may take the form of a cooperative understanding with other plants whereby their stocks of usable spare parts are available to you, just as your stocks are available to them in cases of super-emergency. The laws of chance can be invoked to some extent on the probability that similar breakdowns will not occur in two plants at the same time. One of the best safeguards for emergency is to know exactly what your local electrical contractors are prepared to do on a moments notice, also your power company.

Sources of Spare Parts

Priority limitations today do not permit purchase of many new spare parts. Part of the purpose of the priority system is to prevent material from being used for items which go on the shelf. Therefore additions to the stock of essential spare parts must come largely from reclaimed units taken from the plant.

Few electrical units are completely bad when they are replaced for some defect. Almost without exception, these defective units may be torn apart and most of them salvaged to rebuild other similar articles. Switches go bad usually from overheating due to overload, bad contacts, or loose connections. When the temper has gone due to overheating, the switch and fuse clips lose tension resulting in loose contacts. Having lost temper and tension, the switch will no longer carry full rated load without overheating. It can, however, be rerated to smaller capacity and will serve suitably to carry loads within its new capacity. Clamps on switch and fuse clips will insure firm contact and prevent local heating.

Bad contacts can be repaired by sanding to restore a proper surface. If burns are deep, new material may be added to rebuild the proper amount of copper to carry the current. Many firms are improving good switches and repairing old ones by plating the contacts

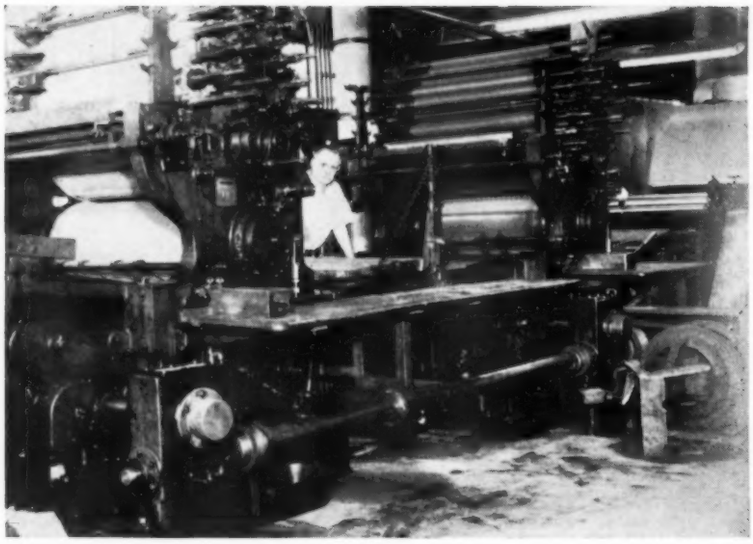
***INDUSTRIAL YARD** converted to an outdoor stockroom. Materials are put on pallets which can be easily handled by the electric-fork truck. (G. E. photo)*

MAINTENANCE GUIDE SHEET . . . *Before you junk it . . . check these points*

EQUIPMENT	TYPE	TROUBLE	REMEDY
STARTING DEVICES	a. Compensator	1–Motor trying to run single phase	Replace fuse or burned out relay coil
		2–Issues a buzzing sound	Insulate coil from ground or insert a new coil
		3–Heating of oil in tank	Change oil as water is in it
		4–Short between contacts	Scrape out all traces of carbon and reinsulate where necessary
		5–No-voltage coil burned out	Repair broken connections
	b. Push Buttons	1–Motor does not start	Inspect connections to starter
		2–Flashes on contact	Correct shorts — replace wire, make new connections
	c. Relays	1–Timing element is defective	Oil bellows
		2–Plunger jammed	Replace coil
		3–Magnets out of adjustment	Readjust and tighten screws
		4–Circuit to no-voltage coil open	Repair or replace fuse
	d. Switches	1–Flashes on contact	Clean carbon — remove dust and grease
		2–Loose contacts	Tighten and repair
SPEED REGULATING DEVICES	a. Rheostats	1–Coils pitted	Clean or replace
		2–Contacts faulty	Replace or repair
	b. Transmission	1–Belts lack tension	Tighten tension or replace
		2–Shafts noisy	Check alignment
		3–Bearings loose or jammed	Oil or replace
	c. Frequency changer	1–Field overheats	Check windings — shorts — grounds
		2–Rotor overheats	Check windings — shorts — grounds
		3–Motor noisy	Overhaul
	d. Contactors	1–Contacts pitted	Remove carbon, clean
		2–Operating mechanism faulty	Repair or renew
MOTORS	a. Bearings	1–Friction — loose or jammed	Oil or replace
	b. Lubrication	1–Clogged holes	Clean out
	c. Ventilation	1–Fan broken	Replace
		2–Clogged vents	Clean out
	d. Windings	1–Short circuited	Remove coil and replace
		2–Burned out coils	Replace
		3–Loose connections	Tighten and solder
	e. Frame	1–Broken	Weld
	f. Insulation	1–Seared or burned	Clean up or replace
	g. Belting	1–Loose	Tighten up
		2–Broken	Patch or replace
	h. Mounting	1–Unsteady	Fasten and repair
		2–Broken	Weld or bolt
	i. Gears	1–Broken	Weld or replace
		2–Cracked	Weld or replace
ASSEMBLY TOOLS	a. Leads	1–Short	Lengthen or replace
		2–Loose connections	Tighten or solder
REFLECTORS	a. Lamps	1–Burned out	Replace
		2–Vibration	Check mounting and steady
	b. Luminaires	1–Out of shape	Reshape
		2–Enamel chipped and cracked	Refinish
POWER DRIVES	a. Belting	1–Worm	Tighten or replace
	b. Shafting	1–Loose	Repair
		2–High tension	Remove tension
	c. Bearings	1–Burned out or loose	Replace or add new parts
		2–Lubrication	Oil up
	d. Support at load points	1–No support	Arrange to support on columns or ceiling
		2–Shaky	Tighten
	e. Alignment	1–High power losses	Align and adjust
		2–Slipping of drives	Align and adjust
		3–Loose connections	Tighten
CONVEYORS	a. Belt	1–Worn	Replace or repair
	b. Idlers	1–Loose	Apply correct tension
		2–Worn	Replace defective idlers
	c. Drive	1–Incorrect speeds	Check motor
RECORDING INSTRUMENTS	a. Voltmeter	1–Does not record	Check coils, needle, connections
	b. Ammeter	1–Does not record	Check coils, needle, connections
	c. Wattmeter	1–Does not record	Check coils, needle, connections
TRANSFORMERS	a. Stationary	1–Coils damaged	Replace
		2–Shorts in coils	Remove cause
		3–Overload or low power factor	Reduce load or increase power factor of system
		4–No water in cooling coils	Clean tubes
		5–Wrong ratio between taps	Connect leads to proper ratio taps
		6–Ground on one-phase	Remove from bank and remove trouble
		7–Overheating of coils, etc.	Flush windings, clean sludge

There are many other types of equipment which cannot be covered.

Small wire ends can be reclaimed and put in use. Use wires and conduits from old circuits no longer used on production lines.



***SAVING MOTORS,** two Hoe metal lithographing presses assembled together in a tandem unit, powered by a 15 hp. motor instead of two motors requiring two sets of controls, etc. The operation is more flexible and there are fewer parts to get out of order which would need replacement.*

with silver because silver is a better contact material than copper.

Loose connections cause arcing at the point of contact which frequently pits the copper too badly for use. Reburnishing the copper and adding washers or plates of copper to restore current carrying capacity will make the switch as good as new for all practical purposes.

Circuit breakers are subject to some of the same troubles as fused switches and to other additional failures. Overheating from overload is seldom found, for the breaker trips before overload damage has been done. There is little opportunity to "jumper" the circuit breaker as is done too frequently with fuses. Neither is it possible to set the breaker loads at excessive ratings as can be done by overfusing of ordinary switches. Contacts are made under pressure in most cases rather than by sliding as in knife switches. Hence contact trouble will arise from arcing when breaking load, rather than from local heating due to poor contact. Breaker contacts can be ground to restore proper contour after which the breaker will operate normally. Most breaker contacts are heavy enough to be resurfaced several times. Also in most larger breakers, the breaker points can be replaced.

Control circuits and coils are the cause of many breaker troubles. Holding coils may be open or short-circuited. Replacement coils are inexpensive and easily inserted. It is possible that coils may be rewound using the wire from the old coil. Control relays may become inoperative because the plunger is jammed, magnets are out of adjustment, the timing element is defective, or the control circuit is open. These items are subject to adjustment or replacement. If the entire unit has been damaged, many of these parts can be salvaged for use as replacements for other relays.

Transformers have few troubles when not abused. However, cases do rust, the oil becomes moist or sludgy, leads burn off, bushings become broken, and coils do burn out, short-circuit, or open circuit. Seldom is it necessary to replace the entire transformer because of damage to one or several parts. The undamaged parts may be used as replacement units for other transformers, or new transformers may be built from parts of damaged ones. Proper care of transformers should include periodic painting of the cases, filtering the oil to remove moisture and carbonized oil, inspection of the cover to check its being moisture proof, checking of the leads to prevent syphoning oil, inspection of bushings for cracks to prevent electrical breakdown, gauges to check oil levels, and thermometers to check temperatures as a warning against overload.

Care of Motors

Motors, like transformers, give little trouble when properly cared for. Care involves a knowledge of load to prevent excessive overloads, proper lubrication, adequate ventilation, periodic cleaning, correct voltage, secure fastening, and minimum tension on the pulley.

The load which a motor can carry depends very largely upon the ability of the motor to dissipate heat. Motor design anticipates that sufficient radiation surface has been provided to carry off all the heat that will be generated at normal load or overload limits when operating in rooms having temperatures below designated limits. When the motor is overloaded, the heat cannot be dissipated but builds up in the coils. The insulation becomes charred so that short-circuits and burn-outs occur. Heat in the motor arises principally from the current in the coils. Low voltage will increase the current and bring overheating just as will overloads. Hence, if the voltage supplied at the motor terminals is low and cannot be corrected, greater care is needed to protect the motor against excessive loads. There are instances in which fuses cannot be secured with the correct current range to protect the motor, so should not be relied upon. Circuit breakers with inverse time elements will give better protection.

As with low voltage, the principal danger from single phasing in a running motor is the build-up of current in the energized phase windings. It is difficult to set the overload protection close enough for full protection against single-phasing. To correct this, no voltage releases should be installed which will act in case any phase fails. Do not rely upon a no voltage release on one phase only, for that is partial protection leading to overconfidence. Under today's plant load conditions, fuses may be expected to blow more frequently, and hence the need for protection against single phasing is more acute than formerly.

Adequate cleaning and ventilation go hand in hand. Cleaning clears the ports in the motor and permits air to pass through and dissipate heat. Ventilation which permits large volumes of cool air to blow across the motor will enable it to carry heavier loads without damage.

Proper lubrication, minimum tension on the pulley, and secure attachment have as their common objective minimum friction of the bearings of the motor. Too little lubricant permits heat to build up in the bearing and causes excessive wear. Too much lubricant may run into the windings.

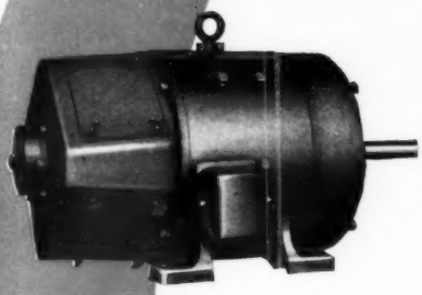
Ingenuity will develop many ways of meeting emergencies with the materials available. A Navy crew recently carved a usable drive shaft out of wood. Materials and equipment are at hand in most plants to build some kind of makeshift part to work until the correct part is found.

Keep always before you these cardinal points in operating with a minimum of new requirements:

1—Maintain present equipment carefully and avoid abuse which might cause damage and breakage.

2—Junk nothing which may be reused in whole or part, in its present or slightly modified state.

CENTURY MOTORS are Famous for Their Ability to "Keep a-running"



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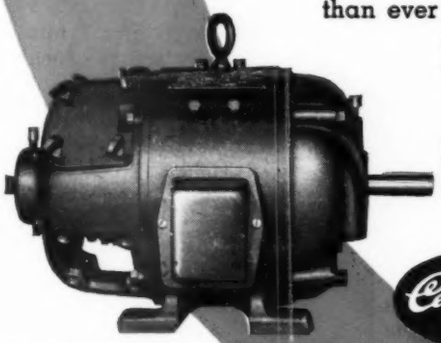

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Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

STARTING A SYNCHRONOUS MOTOR

QUESTION 67. Would you recommend starting a synchronous motor, 150 hp., 150 amp., 480 volts, 900 rpm., 3 phase, 60 cycle, with a squirrel cage winding, across the line? The field is always closed. The machine is twenty years old and starting parts of the switch are worn out. The starting current would cause no trouble on the lines.—W.L.C.

A. TO QUESTION 67. Full voltage starting is most generally used on slow speed motors when the supply system is large as compared to the motor. Reduced-voltage starting is usually necessary for medium and high speed motors. Also across-the-line starting requires more control equipment and it is usually automatic control.

In your case, I don't believe I would try to use across-the-line starting without the proper control equipment. It would probably be more practical to replace your worn out starting equipment.—V.M.

A. TO QUESTION 67. The "closed field" is taken to mean a permanent connection to a direct connected exciter.

Low voltage starting is usually required to limit the starting current and, in some cases, to limit the starting torque. Although limited starting current may not be required in this case, possible damage to the load due to the increased torque resulting from full voltage starting should be considered.

The excitation time constant might be great enough to cause overheating of the motor during induction operation. Decreasing the exciter field resistance and, if the motor has a field rheostat, altering this resistance either up or down may allow the motor to synchronize sooner. In any case, the starting load should be a minimum. A trial start could be made on full voltage and if excessive acceleration time was required (say more than 15 seconds) the breaker could be tripped before damage was done to the motor.

In general, full voltage starting of synchronous motors is considered preferable if special operating conditions do not dictate otherwise.—G.I.S.

FORMULA FOR SLIP RING MOTORS

QUESTION 68. Does some one have a formula for figuring the size and number of grids or resistors for three phase slip ring motors? I would like to hook these up for both starting and continuous duty. Our motors run from 5 to 300 hp. I can hook 'em up but I am not sure of the number or size required.—R.P.

A. TO QUESTION 68. Resistors in the rotor circuit are contributing factors in governing speed, starting current, and torque of a motor. If the desired starting feature is attainment of a high starting torque the amount of rotor resistance varies from that necessary to obtain a relatively low starting current. In addition, it also varies from the value required to produce a substantial starting torque and moderate current. Consequently, both starting torque requirement and peak current limits should be known.

For starting requirements when values of starting torque, power factor, and current are not specific features the motor characteristics need not be considered. Computations for determining the values of resistance may be made, when based upon two or more constants obtained from known characteristics or actual readings from test runs. There is a formula for determining the full-load rotor current which may be found in standard engineering texts. All a.c. motors have current ratings marked on the nameplate.

If it is found advisable to estimate the starting current, a value equivalent to three times the running current can be used. From this, the area and the resistance of the grids can be computed. Resistance added to the rotor reduces the starting current. Consequently the grid area need not be excessive. In order to allow for a reasonable range of starting torque and current the total amount of external rotor resistance should be at least four times greater than rotor resistance. This should be divided into three or more steps which will provide a suitable point where power factor, current and consequent torque are derived for the particular application.—O.A.

A. TO QUESTION 68. The following are formulas for voltage between rings, current per phase, and resistances per phase. The resistances of the grids or resistors will have to be measured or taken from the nameplate per unit as there is too much variation in the grid sizes to give a formula for general use of the resistors themselves.

E_R — Rotor volts between rings
I_R — Rotor current per phase
R_{RH} — Rheostat resistance per phase
K_1 — 1.73 for star connection
K_3 — 3 for delta connection

$$R_{RH} = \frac{E_R\,(1 - \text{slip in per cent})}{I_R\,K_3}$$

$$I_R = \frac{HP \times 746 \times K_2}{E_R\,(1 - \text{slip})3}$$

K_2 — 1.73 star connection
K_2 — 1 delta connection

$$E_R = \frac{N_R \times F_{CR} \times F_{W_r}}{N \times F_C \times F_{W_r}}\,K_2 \times E$$

N = No. of conductors in series per phase (stator)
N_R = No. of conductors in series per phase (rotor)
F_{CR} = Rotor chord factor
F_{WR} = Rotor distribution factor
F_C = Stator chord factor
F_W = Stator distribution factor
E = primary volts

—M.H.

A. TO QUESTION 68. First it is necessary to know the rotor open-circuit voltage and rotor full load current. If not given on the motor nameplate, the rotor open-circuit volt-

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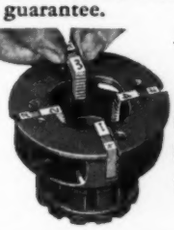

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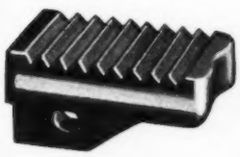

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. . . . Protects Wiring With Steel . . . . Saves Steel for Armament

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A NTINUOUS FOOT-RULE ON EVERY LENGTH!

Reader's QUIZ

[FROM PAGE 60]

age is determined by exciting the stator with rated voltage and taking voltmeter readings across the collector rings with brushes lifted. Rotate the rotor slowly by hand while taking the voltmeter readings and use the average voltage reading. Rotor full load current will then be calculated as follows:

$$\text{ROTOR FL AMPS PER TERMINAL} = \frac{\text{RATED HP} \times 746}{\text{ROTOR OPEN-CIRCUIT VOLTS} \times 1.73 \times .92}$$

For speed regulating duty, the resistance required in each leg of the Y-connected resistor is calculated as follows:

$$\text{OHMS PER LEG} = \frac{\text{ROTOR VOLTS}}{\text{ROTOR AMPS} \times 1.73} \times \frac{\%\text{RPM}}{\%\text{HP}}$$

%HP is the per cent of rated horsepower required by the minimum load desired to be carried at lowest reduced speed. %RPM is the per cent reduction below rated no-load speed, of the lowest desired reduced speed. Here it should be remembered that slip ring motors are generally not operated continuously at speeds below about 50 per cent of no-load rated speed on account of overheating due to decreased ventilation. Also, the horsepower capacity is reduced in direct ratio to the reduction in speed. To determine the number of resistance grids required stack and clamp together a suitable number, pass direct current through them from a 6-volt storage battery and take readings of volts and amperes. From these readings, applying Ohm's law, can be calculated the resistance of the grids tested and the number required.

I know of no definite standards of current-carrying capacity by which to determine the size of resistance grids. The capacity depends upon the ability of the resistor assembly to dissipate heat. Large resistors of open construction, well-ventilated, cast-iron grids may be operated continuously at about 1000 amperes per square inch of their conductor cross-sectional area. Smaller or partially enclosed resistors should be operated at lower current densities. The cross-sectional area can be determined by measuring the width and thickness of the convolutions in the central part of the grid.

Resistors used for starting duty only can be calculated as follows:

$$\text{OHMS PER LEG} = \frac{\text{ROTOR VOLTS}}{\text{ROTOR AMPS} \times 1.73}$$

This gives the resistance of Y-connected resistors required for a starting torque which is equal to the torque at full load. If a lower value of starting torque is desired, the resistance should be increased in the same ratio that the starting torque is reduced. For starting duty only, the current density in the grids may be two to three times the value given above for speed regulating duty, depending upon the length of time required to bring the load up to full speed.—H.G.T.

BRUSHES ON COMMUTATOR

QUESTION 69. On one of our d.c. motors which has four sets of the brushes on the commutator, two sets of the brushes wear away faster than the other two. Using different kinds of brushes and careful adjustment does not change this relative wear. What would cause this uneven wear, when all of the brushes are of the same make and grade?—R.C.M.

A. TO QUESTION 69. First check with a strip of paper around the periphery of the commutator to see that all the brushes are spaced as near exactly apart in the four holders as possible. This can be done by placing the strip of paper under all four sets of brushes around the commutator and drawing a pencil line at the heel of each brush; then remove the paper and measure the distance between each line. They should not vary more than one-sixteenth of an inch.

If this does not remedy the condition, check the air gap of all the field pole pieces and especially the air gap of the commutating poles (inter-poles) to see that this gap is equal all the way around. If the air gap is not equal all the way around the poles will require shimming accordingly.—W.B.

A. TO QUESTION 69. Your trouble may be caused by one or more of the following: Damaged or improperly connected interpoles; uneven brush tension; sluggish brush springs; or loose brush leads. Sometimes it may be due to damaged field coils which make the good field coils carry the load while they loaf. Also, in rare instances, it may be due to faulty bearings which give the brushes an unequal load due to the variation in the air gap.—H.S.

A. TO QUESTION 69. Brush wear is usually caused by uneven brush spacing which causes arcing, this in turn causes undue wear on the brushes.

In setting brushes for d.c. generator with equal brush spacing put a strip of

paper around the commutator under the brushes and mark each brush at the front edge then measure between marks and set brushes at correct place. See that each brush covers the same number of bars and has the same slope and each set is on the neutral position and sets square with the commutator in all directions.

You do not say if negative or positive or a brush of each is wearing out. Check the field coils. A weak coil may put more load on the good set of brushes and cause the brushes of this set to carry more load, wearing them down at a faster rate.

Remember in treating a d.c. generator having four poles you are really working with two generators in parallel. with only one field circuit even if they are built in a single unit. They must be balanced electrically as well as mechanically and if they are not, the trouble usually will show up in the brushes and the commutator first.

A complete check of the generator may be required in order to locate the trouble. Even this is not always productive of the desired results as the tests will mostly be made while the unit is cold and it may have different characteristics when it is at normal operating temperatures.—W.L.C.

SYNCHRONOUS MOTOR

QUESTION 70. We have a 150 kva., 480 volt, 60 cycle, 3 phase generator with direct coupled exciter which we would like to change to a synchronous motor for power factor correction. What changes will have to be made on the generator before we can use it as a motor and what starting equipment will be required?—J.J.L.

A. TO QUESTION 70. No change will be necessary to use the generator mentioned, as a synchronous motor. Although it is not necessary that there be differences in design detail of alternators and synchronous motors, frequently better motor characteristics are obtained by slight changes in design. If the alternator (generator) is of the slow speed type (up to 750 r.p.m.) it may or may not have a squirrel cage winding. This is called the amortisseur or damper winding. If there is no amortisseur winding the motor will have to be started by external means and synchronized like an alternator, after which it will operate as a motor. However, if there is a amortisseur winding it may be started as an induction motor by impressing an a.c. voltage on the stator and then applying d.c. excitation as the motor approaches syn-

Reader's QUIZ

[FROM PAGE 65]

chronism. As the starting current will be high it is desirable to use a compensator. After the motor has come up to speed, close the field switch before throwing the compensator into the running position. Usually the motor will pull into synchronism at this point. The starting process is considerably simplified by use of an automatic starter which brings the motor up to speed and automatically applies excitation at the proper time. There are several different makes of these on the market and they are preferable to the compensator means of starting.—J.A.H.

A. TO QUESTION 70. A synchronous motor is primarily a synchronous generator with its function reversed. However a synchronous motor is usually provided with pole face windings necessary for the self-starting of the motor. When an auxiliary motor is used to start the motor the pole face windings are not necessary for starting.

If you are going to make the motor self-starting, it will be necessary to use a compensator to provide reduced voltage for starting. The compensator should be provided with several taps. When the motor is running at about 75 to 80 per cent synchronous speed, adjust the motor and exciter field rheostats until the current taken is a minimum. Connect the motor for full line voltage and adjust rheostats for normal current and excitation.

In your case, I believe the best method, if it would be possible to do so, would be to use a small auxiliary induction motor. No compensator is required with this method. The auxiliary motor brings the set up to or close to synchronous speed, then it can be thrown on the line. Some means of disconnecting the starting motor is necessary. A 15-hp. motor would be large enough to provide the starting.—V.M.

A. TO QUESTION 70. There is a marked difference in construction design between a.c. generators and synchronous motors. The generators invariably lack a damper winding. Conversely, synchronous motors, with the exception of the older types, rarely lack the additional damper winding. The significant point is, that without a damper winding the machine may not produce sufficient starting torque of its own account and will have to be brought up to speed by external motive power. It constitutes the main feature in a

conversion problem. There may be instances where the construction of the pole piece and field coil retaining discs are sufficient to develop eddy current reactions. However, there is only one method to prove the adequate usefulness of this construction, and that is by a trial start.

The machine may be connected to the line through a starting compensator or a wye-delta switch, depending on the type of winding. When the speed is about 85 per cent or preferably more of synchronous value the field may be excited by means of the direct coupled exciter which should provide adequate responsive excitation at this point. If the starting torque is insufficient, a damper winding may be added to each salient pole. It should be constructed of ample copper capacity and placed around each pole near the surface. Trial test runs may have to be made with various values of shunts connecting each pole damper winding in order to determine the required starting torque for the particular application.—O.A.

A. TO QUESTION 70. No changes are necessary in order to use the 150 kva. alternator as a synchronous motor, except as may be required for starting. If the generator is equipped with damper winding on the field poles, which are similar to squirrel cage rotor windings, it can be brought up to speed by using a starting compensator in the same manner as a squirrel cage induction motor. The compensator should be approximately 150 hp. and equipped with overload relays set at approximately 20 per cent above the generator full load current rating. A field switch should be provided together with a suitable starting resistor so connected as to shunt the resistor across the generator fields when the field switch is open. A.c. line ammeter, d.c. exciter ammeter and exciter shunt field rheostat should be provided. In starting, the field switch is open, the generator is brought up to full speed with the compensator; then the field switch is closed and the exciter shunt field rheostat adjusted until the a.c. line ammeter indicates the desired amount of corrective current.

If the generator is not equipped with damper windings, it may be brought up to speed by an auxiliary starting motor, about 7½ hp., belted so as to drive the generator at just slightly above its rated speed. The generator should be provided with a main line oil circuit breaker, and the same instruments, field switch, starting resistor and rheostat described above. In starting, bring the generator up to speed by means of the starting motor with the field switch open, close the main line circuit breaker, then close the field switch and adjust excitation, after which

Reader's QUIZ

[FROM PAGE 67]

the starting motor is disconnected from the line.—H.G.T.

A. TO QUESTION 70. In order to use the 150 kva., 480 volt, 60 cycle, 3 phase generator as a motor, it will be necessary to have so called damping or amortisseur winding in order to start the motor as an induction motor. This is a short circuited low resistance or damping winding which is composed of copper grids placed in the pole faces and copper bridges between the poles. Such windings may be provided in your generator. If so, the problem will be simplified.

You will also need a compensator or reduced voltage starter of the proper capacity. This will supply current at reduced voltage to start the motor and so reduce the inrush of current. The starter or an auxiliary switch must provide for shorting the field winding. When the motor speed increases as much as it will at reduced voltage, the starter is to be thrown to the full voltage tap and when it approaches synchronous speed the short circuiting switch is to be opened and the switch closed to excite the field.

In order to provide power factor correction, it may be necessary to increase the excitation.—I.E.W.

A. TO QUESTION 70. If this generator is being converted into a motor to pull a load I would advise against it as I do not believe it will ever be satisfactory. If the generator is to be floated on the line for power factor correction alone then it will work very satisfactorily.

The generator should be connected to a motor large enough to start the generator and bring it up to full speed. A clutch or some other means of disconnecting the drive motor should be provided, also a motor starter for the generator.

The generator needs no changing mechanically, but is brought up as close to synchronous speed as possible with the drive motor, then the generator is connected to the three phase line and the drive motor disconnected from it. The generator field must be excited immediately and the machine will then pull up into synchronous speed and if over excited will produce the desired power factor correction. The generator field is often excited and machine brought up to synchronous speed before the drive motor is disconnected.—C.E.S.

FORMULA FOR FINDING KVA

QUESTION 71. Please give the formula for finding kva. when the horsepower is known. We have a laundry with a connected horsepower load of 110 hp. fed from a bank of three 50 kva. transformers 220 volts, 3 phase on the secondary side, 2300 volts on the primary side. Is this bank overloaded?—F.W.B.

A. TO QUESTION 71. The formula for this question is as follows:

$$\frac{\text{hp.} \times 746}{1.73 \times \text{volts} \times \%\text{eff.} \times \text{p.f.}} = \text{amps.}$$

$$\frac{\text{amps} \times \text{volts} \times 1.73}{1000} = \text{kva.}$$

Assuming the power factor and efficiency is 100 the bank of three 50 kva. transformers are not overloaded.—B.W.

A. TO QUESTION 71. Formula for finding kva. when horsepower is known:

$$\text{horsepower} \times .746 = \text{kw.}$$

$$\frac{\text{kw.}}{\text{power factor}} = \text{kva.}$$

In respect to the load of the transformer bank, I am assuming an over-all power factor of 75 per cent. A laundry of this size would probably have several motors that are under-loaded, due to reversing operations in washers, and the necessity of the motors taking a heavy bump. The under-loaded motors would create a poor power factor. However, I am also giving consideration to the heating equipment and lighting which would have a good power factor. An over-all power factor of 75 per cent would be very close to the actual power factor and low enough to figure the transformer load.

By applying the above formula for 110 horsepower at 75 per cent power factor, the load on the bank would be as follows:

$$\text{hp.} \times .746 = \text{kw. or } 110 \times .746 = 82.06 \text{ kw}$$

$$\frac{\text{kw.}}{\text{p.f.}} = \text{kva. or } \frac{82.06}{.75} = 109.4 \text{ kva.}$$

The total capacity of the bank of three 50 kva. transformers would be 150 kva. The above load of 109 kva. would only create a 73 per cent load on the bank.—C.J.R.

A. TO QUESTION 71. The general formula for changing horsepower to kva. is:

$$\text{kva.} = \frac{746 \times \text{hp.}}{1000 \times \text{eff} \times \text{power factor}}$$

This is on the basis of 746 watts per horsepower. In a laundry there will probably be various sizes of motors and

Reader's QUIZ

[FROM PAGE 69]

since the total is 110 hp. there must be some small motors. I would assume an efficiency of about 80 per cent and a power factor of 75 per cent. If motors are lightly loaded perhaps these figures should be reduced but these seem proper.

Solving we get:

$$\text{kva.} = \frac{746 \times 110}{1000 \times .80 \times .75} = 136.8 \text{ kva.}$$

With the 3-50 kva. transformers this should not constitute an overload.—J.E.W.

A. TO QUESTION 71. The following is the formula requested:

$$\text{3-phase kva.} = \frac{.746 \times \text{hp.} \times \text{demand factor}}{\text{power factor} \times \text{efficiency}}$$

Assuming a demand factor of 100 per cent an average motor efficiency of 70 per cent and an average power factor of 80 per cent at your plant, the average kva. demand of the 110 hp. connected load per the above formula would be:

$$\frac{.746 \times 110 \times 1}{.8 \times .7} = 146.5 \text{ kva.}$$

The capacity of the transformer bank of 3 times 50 or 150 kva. under the assumed conditions therefore will not be overloaded.—G.I.S.

A. TO QUESTION 71. The p.f. (power factor) of the system would have to be known before the kva. could be determined from the hp. When this is known the formula for finding kva. is:

$$\text{kva.} = \frac{\text{hp.} \times 746}{\text{p.f.}} \div 1000$$

The p.f. may be found by several methods, the simplest being by use of a power factor meter. If such an instrument is not available, measure the volts and the amperes on the secondary at the transformer bank. With the readings obtained with these meters use the following formula to find kva.

$$\text{kva.} = \frac{\text{amps.} \times \text{volts} \times 1.73}{1000}$$

The problem states that 110 hp. is the connected load, I doubt that the maximum will ever be as much as 110 hp. However, assuming a p.f. of 60 per cent the kva. load would be:

$$\text{kva.} = \frac{110 \times 746}{0.60} \div 1000 = 136.7 \text{ kva.}$$

Since the bank is 150 kva. (3-50 kva.) the bank is not likely to be overloaded. —J.A.H.

Can You ANSWER these QUESTIONS?

QUESTION Z2—How can I determine the amount of resistance required for a discharge resistor on a 60 inch lift magnet used on 250 volts d.c. The ampere rating is not known. Would this resistor be just as effective if connected permanently across magnet winding or is it necessary to disconnect it every time magnet is energized? —J.J.L.

QUESTION A3 Do any of the branch circuits in diagram receive power factor correction from the synchronous motor? If none, how far on the line would correction exist?—W.R.T.

QUESTION B3 In a single phase motor with 24 slots in the stator, three coils per pole, one coil lying in slots one and seven with 29 turns, one coil in slots one and five with 53 turns, and one coil in slots one and three with 29 turns, what is the distribution factor or the effective turns?—C.F.B.

QUESTION C3 We are purchasing two 100 kva. transformers for 5500-volt, 2-phase to 240-volt, 3-phase service. We expect later to use these transformers plus an additional similar unit on a 4160-volt, 3-phase, 4-wire service. We expect later to use these transformers plus an additional similar unit on a 4160-volt, 3-phase, 4-wire service. We have a choice regarding 3-phase primary connections. We can have two high-voltage coils rated 2750-volts with taps at 2400-volts for parallel operation on the 2400/4160-volt grounded neutral system. The other alternative is to have a 5500-volt winding with a tap at 4160-volts for future delta operation. The difference in price is very small. Which is to be generally recommended? The 2400 or the 4160-volt taps?—J.M.T.

QUESTION D3 Our motors are rated to operate from 440-volt, 3-phase, 60-cycle power. We have 14 ½-hp. squirrel cage motors driving a flight conveyor system which we believe could operate safely at a considerably higher speed to carry more material. These motors never draw more than 80 per cent of rated full load current. It is proposed to operate the system on higher frequency power derived from two available 40 hp., 1760 rpm. slip ring motors with 265-volt, 3-phase rotors. What ratio of pulley diameters should we use on the two motors to connect them with V-belts, and if a transformer is needed what will be the power and voltage rating required?—G.I.S.

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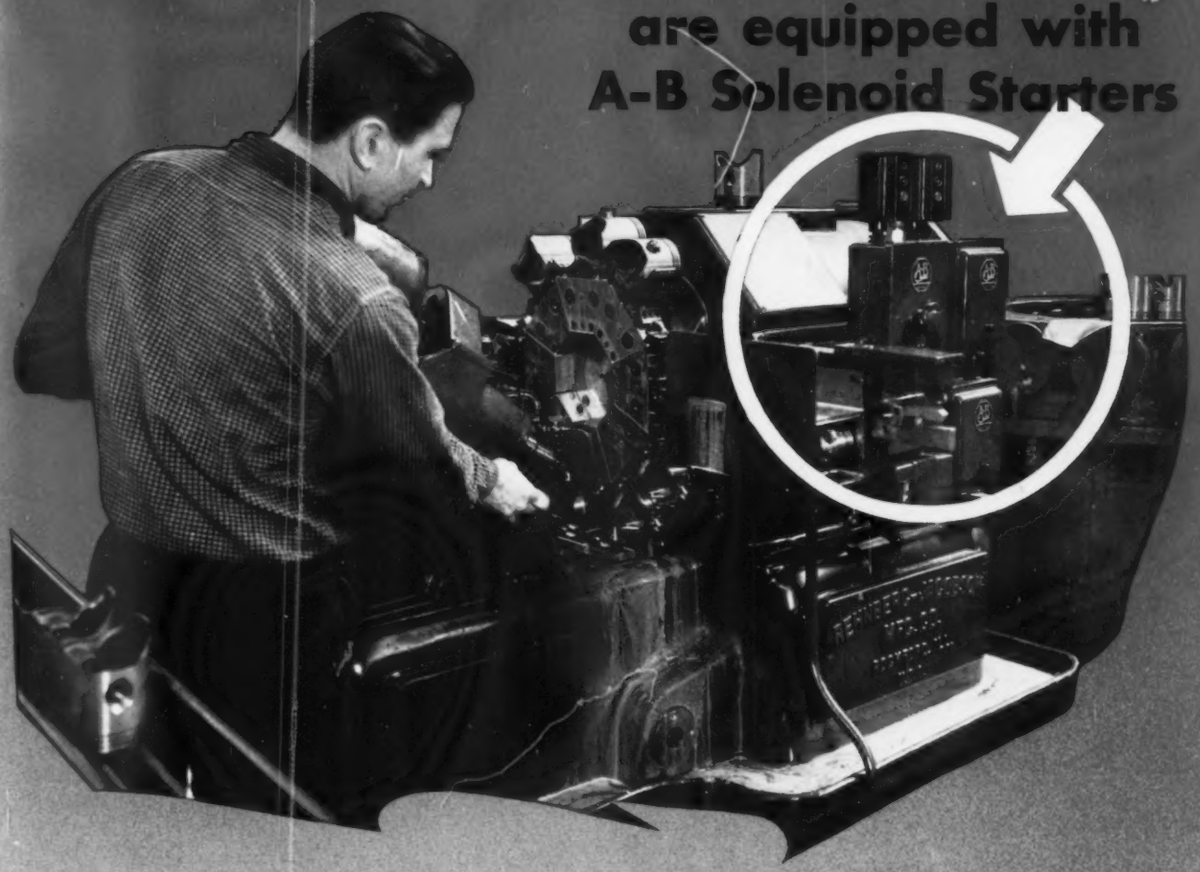
if your motorized machines are equipped with A-B Solenoid Starters



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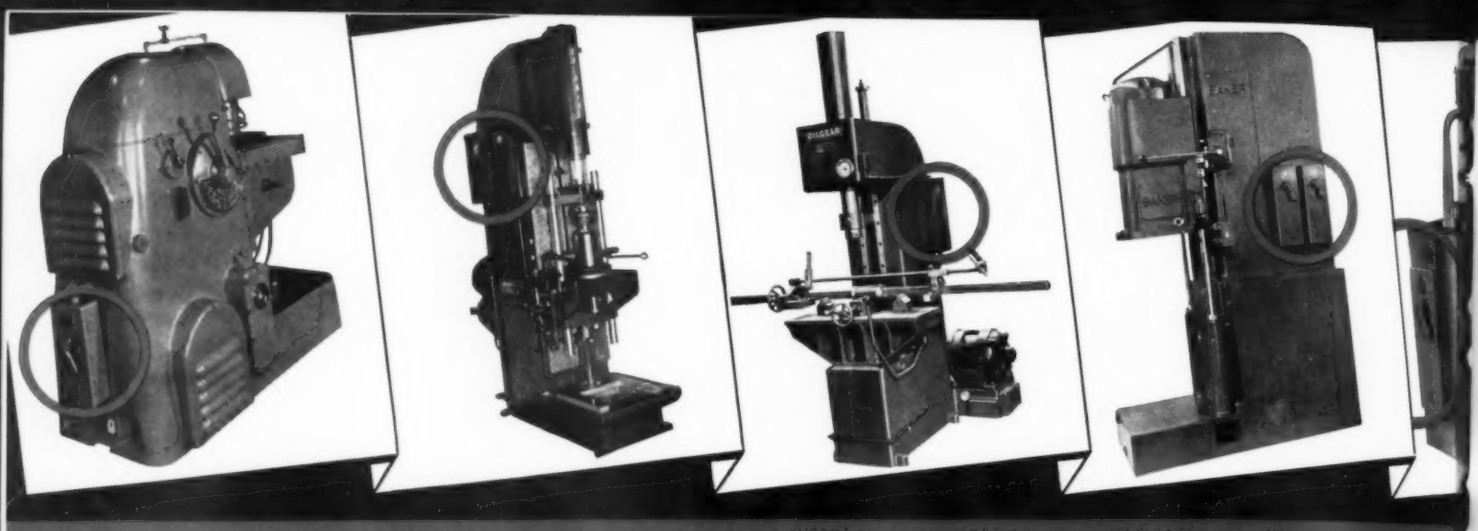

TYPICAL INSTALLATIONS OF ALLEN-BRADLEY BULLETIN 712 COMBINATION STARTERS ON MACHINE TOOLS

How to Save critical materials *in your motor starter installations*

The easiest and quickest way to save critical materials is to simplify your control installations. For example—don't use a motor starter and a separate disconnect switch when you can buy both in one cabinet. Here are the advantages of A-B Combination Starters:

SAVE WIRING—You eliminate the wiring and labor of connecting two separate units—starter and disconnect unit.

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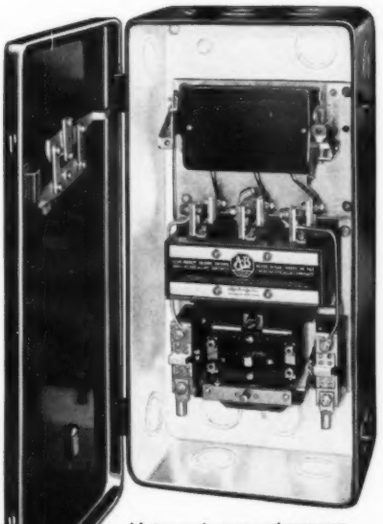

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QUALITY

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

RAY EDENFIELD, president, Edenfield Electric Co., Nashville, Tenn., finds a few moments to relax and check new company insignia. Ray, who has been hopping about the country on defense work, was recently elected first vice-president of the Tennessee Electric Contractors Association.

SIREN MOTOR

Q. *"I have received an order to install an air raid siren but the specifications do not coincide with what I believe are the National Electrical Code requirements.*

This job calls for the wiring of a 5 hp. 3 phase, 60 cycle motor, equipped with remote control switch and push button station. The remote control is equipped with thermal protection for the motor. The manufacturer advises however, that this 5 hp. motor be wired with No. 6 wire and that this line be fused at 100 amperes.

The National Electrical Code motor tables permit the use of No. 12 wire for a 5 hp. motor (and would not prohibit No. 6 of course), but limits the branch circuit fuse to 45 amperes. This 45 amp. fuse size is based (Section 4342), on the motor full load current rather than on the branch circuit wire capacity.

Will the installation as specified meet with approval?"—J.D.R.

A. It should. Of course the manufacturer's recommendations seem to violate Section 4342, but the characteristics of the installation should be taken in to account. A siren motor must have high torque so as to accelerate to full speed almost instantly. Full voltage should be delivered to the motor and in a good many installations the motors are quite distant from the service point. It is also most important that there be no interruption to the current.

The 100 ampere fuses on the branch circuit to a 5 hp. motor seems to be out of line with the Code. However, the motor itself is protected by the thermal device in the remote control. So all we have to worry about is to protect the branch circuit against short circuits.

The manufacturer wants No. 6 wire instead of No. 12 in order to deliver full voltage to the motor and to take care of the high torque. There can be no objection to that. Also, the 100 amp. fuse is in the same proportion (225 per cent) to the carrying capacity of No. 6 wire as the 45 amp. given in the motor tables is to the 20 amp. capacity of the permitted No. 12 wire.

It is plain that with a short circuit on No. 6 wire a 100 ampere fuse will immediately blow. We should also keep in mind that the duration of operation of the motor is very short and intermittent.

Therefore, in view of the above it can be seen that the specifications of the manufacturer are not in violation of the intent of the Code and that approval of such an installation should be given.

We recommend further that the motor circuit for a siren be connected as close to the house service as possible and preferably with no other fuses than the motor branch circuit fuses between the motor and the service fuses. In this way the blowing of other fuses will not affect the siren.

QUESTIONS, *Please.*

EVERY day the questions on the Code that pass across the desks of electrical inspectors placed end to end would reach too far to worry about. A great many of them are trivial, a very few are fundamental, requiring formal interpretation by the Electrical Committee. A goodly number, however, require reference and cross-reference coupled with sound judgment and a sincere willingness to let the Code decide.

In "Questions on the Code" we like to tackle this latter group. For each time you encounter a Code problem you can be fairly certain that others are trying to answer the same question. That's why we publish your questions. That's why this department is conducted by F. N. M. Squires, a nationally recognized authority on the Code. That's why it is one of the most popular departments in Electrical Contracting.

Inspectors, contractors, industrial electrical men, motor shops are all affected in some way by the Code. And the answers to the questions you ask help to clear up similar problems all over the country. So, let's have your questions—today.

READILY ACCESSIBLE

Q. *"In the third sentence of Section 3647, it is intimated that over current devices for the protection of taps made to a busway system, may not have to be 'readily accessible.' Is this not a violation of the general Code principle?"—E.H.*

A. No, this is an exception to Section 2535a, and is so stated therein. The reason for this is that in a place large enough to use a busway system, a maintenance man is generally required and where a place is under the constant and competent supervision of a maintenance man, the question of ready accessibility of some parts of the equipment is not important as they always have a step ladder handy. While in a place where fuses have to be changed by a layman, we want them "readily accessible."

Questions on the Code

[FROM PAGE 73]

LAMP LOAD

Q. *Can I connect up 6-300 watt lamps on one branch circuit of No. 14 wire or would this be a violation? If so, what would be the proper amount on such a circuit and what switch could I use?—G.R.D.*

A. In all probability this is a continuous load, "such as store lighting and similar load" as mentioned in the last sentence of Section 2107 in which case a load of only 12 amperes could be connected to a 15 ampere branch circuit.

The load mentioned above (6-300 watt lamps) at 120 volts would be 15 amperes so would be excessive for a 13 amp. branch circuit. The limit is 12 amps. The switch must be either one which is "T" rated and of same capacity as the load or, if not "T" rated must be of twice the capacity.

GENERATOR SWITCH

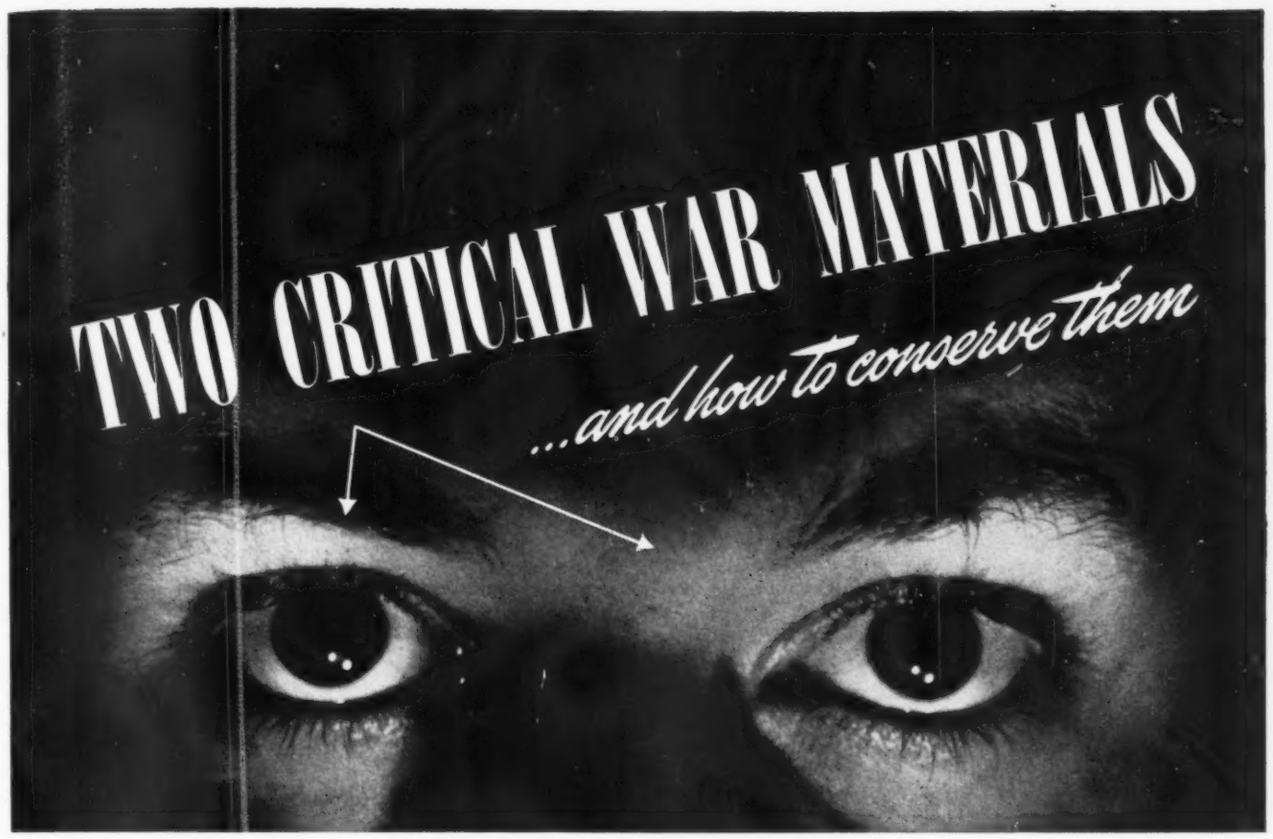
Q. *We have 3 wire generators with grounded neutrals. The main leads are connected through oil switches to the main switchboard busbars and the neutrals are connected solidly to the neutral bus which is grounded. The lighting is connected between the main leads and the neutral. Our inspector has ruled that there should be switches in the neutral leads between the generators and the neutral bus. Does the Code require this?—P.E.H.*

A. No. A switch is not required in the neutral but some means of disconnection such as a bolted connection should be provided. If a switch is to be provided for the neutral it must be so arranged that it will be impossible to open this neutral leg without first opening the ungrounded legs, or unless a multi-pole switch is used which will open all legs simultaneously.

"T" RATING

Q. *Is it permissible to use a 10 amp. single pole lock switch on four-300 watt incandescent lamps?—J.T.A.*

A. At 120 volts, 4-300 watt lamps would use 10 amperes. If the 10 amp. lock switch is one which is "T" rated it would be all right, but if not "T" rated it should be of 20 amp. capacity.



•Thirty-seven million war workers man America's front line of fighting production—seventy-four million eyes that must not be wasted or abused.

Even more! They should have lighting that lifts the strain of their work—helps attain required close tolerances and reach production goals.

Right in your own territory there are war plants which need the cool, glareless, shadowless illumination of fluorescent lighting.

And consider this: When you equip a plant, and production is stepped up, you've contributed thousands of man-hours to the war effort.

Because of this improved efficiency without the need for additional copper wiring, virtually every plant engaged in war work qualifies for priorities on fluorescent lighting.

Ever since the first commercial and industrial use of fluorescent lighting, Sylvania's leadership has been based on its progressive technical developments. These continuous advances have produced Sylvania Lamps which today deliver these results:

They give more light, more lumens per watt. They are longer lived. They have a more uniform coloring. They have a finer, smoother coating.

So get to your war plants. Help them step up production. If you wish, our representative will gladly assist you in securing the necessary priority rating. Write Department EC-11.

Miralume Fixture HF-100P with composition reflector. There is a complete line of Sylvania Fluorescent Fixtures available to fit any industrial need. From the standpoints of economy in use of critical materials, color and quantity of light, and light distribution, these fixtures provide the last word in fluorescent lighting efficiency. They are obtainable, on priority, by plants engaged in war work—upon proof of genuine need for better lighting.

SYLVANIA

ELECTRIC PRODUCTS INC.

formerly Hygrade Sylvania Corporation
Salem, Mass.

Incandescent Lamps, Fluorescent Lamps, Fixtures and Accessories, Radio Tubes, Electronic Devices

Motor Shops

SPARE COILS SPEED REPAIRS

"Reduce to a minimum the time a motor is actually out of service," is the rule at the Chattanooga Armature Works, Chattanooga, Tenn.

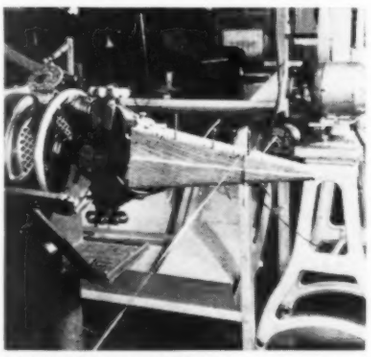
To give its customers the quickest possible service, this motor repair shop maintains a large stock of ready-made coils just waiting to be placed in burnt-out motors. A complete set of records on customers' motors is filed and the coil department is always busy replenishing the coil stocks. The spare coil inventory shows about 350 complete sets of coils, wound, insulated, dipped and baked. (A set of coils is enough to do a complete motor rewind job.)

In some cases coil sets are shipped direct to customers to expedite repairs, or a crew may go with the coils and do the job in the field. No time is lost waiting for the necessary coils to be made up. Coils are also made in Chattanooga and sent to the company's branch shops in the mining area of Middlesboro, Kentucky and in Knoxville, Tenn. The company maintains a crew of 42 at Chattanooga and 14 at the two branch shops.

***PORTION OF SPARE** coil stock at Chattanooga Armature Works. Coils are awaiting delivery to mine customers or quick placement in motors entering the shop. Reduction of motor "out of service time" to a minimum, is the company goal.*

BASKET COIL WINDING HEAD

A pyramid type, wood block is used as a winding head for single phase motor, basket wound coils and starting windings in the small motor department of the Willey-Wray Electric Co., enterprising Cincinnati, Ohio, motor service shop. The block is held securely in the jaws of a small armature winding head by two end pins. Clamping the armature head jaws together tightens the grip on the block.



***WINDING BLOCK** of wood replaces conventional steel or aluminum winding cone for making basket wound coils and starter windings in this shop. It can easily be attached to a standard armature winding head.*

The winding block is about 12-in. long; 6-in. by 4-in. at the base and 2½-in. by ¾-in. approximately at the top. A series of 38 holes on approximately ½-inch centers are drilled into each of the four 12-inch edges. Pins made of ⅛-inch welding rod are inserted into the holes to act as stops and guides for winding the various sized coils.

A second block of similar design but smaller in size is used to make smaller coils.

COLOR CODED TOOLS

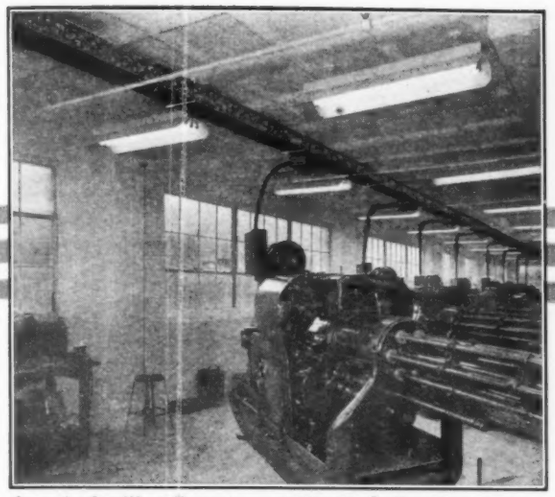
Small and large tools allocated to individual work benches at the Mielke Electric Works, Inc., Duluth, Minn., repair shop, seldom stray to other benches or other parts of the shop. If they do, they are quickly and easily detected through a color coding system.

All benches at this shop are equipped with a narrow shelf to hold accessories and small tools. The edge of this shelf is painted—a distinctive color for each individual bench. All tools allocated to each bench are banded with the same color paint. Thus, if a red banded tool accidentally shows up at an orange banded bench, the mechanic knows immediately where it belongs and can return it to the proper bench.

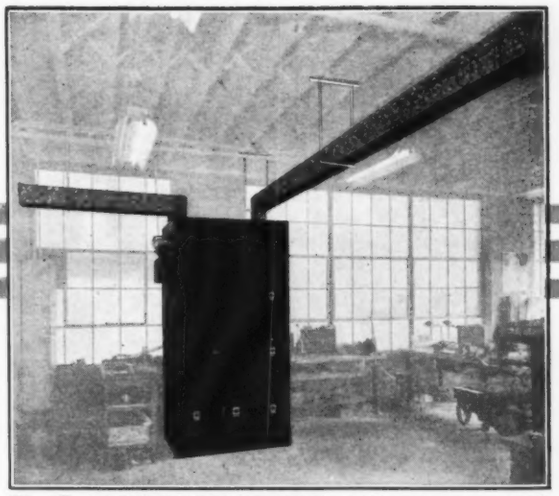
On the underside of each bench are suspended three tiers of shallow metal drawers to house the small tools. Shallow drawers are preferred because they eliminate the digging and hunting that usually is necessary to find a tool in deep drawers. Both of these simple ideas have done much to eliminate lost time, lost tools and wasted steps at the Mielke shop—another step toward maximum efficiency.

HYDRAULIC COIL PRESS

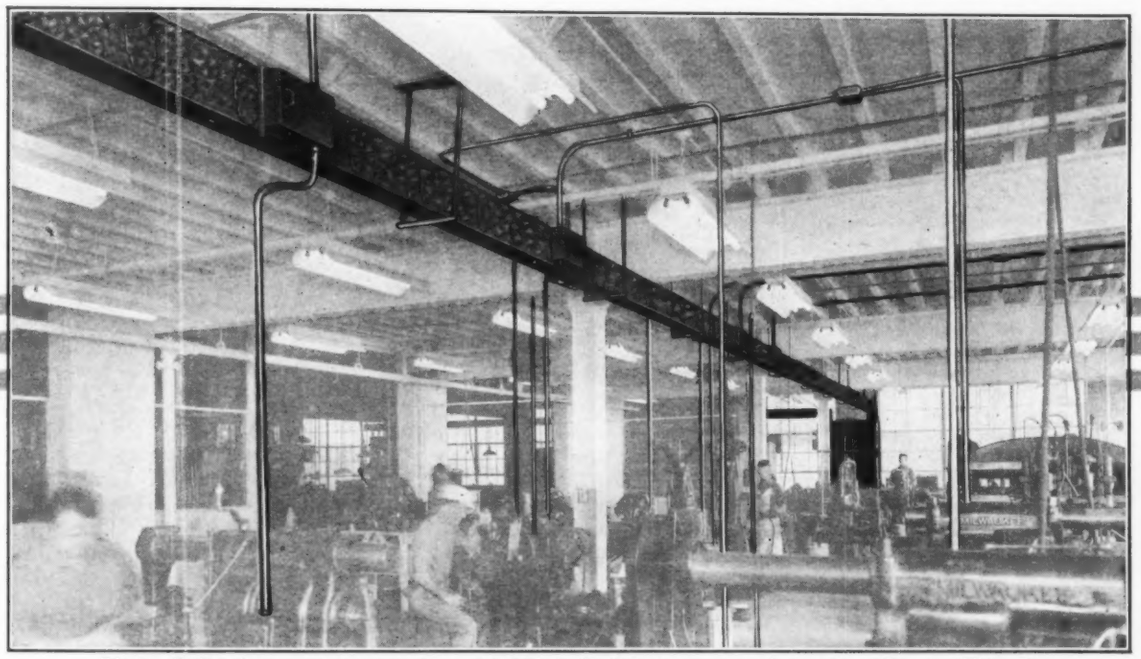
A simple coil press was developed from an ordinary hydraulic bench vise by the M. J. Torrance Electrical Supplies Co., Inc., motor repair organization of Rock Island, Illinois. They simply removed the original jaw plates (6) of the vise shown in the attendant photograph and replaced them with sets of machined clamps (2), whose length and width depended on the size of the coils to be pressed. The coil clamps rest on the seat of the original jaw plates and are fastened to the vise jaws by small angles (5) and machine screws which fit tapped holes in the vise jaws.



A part of a "loop" system of Plugin (FA) Busduct feeding a battery of automatic screw machines. Low head-room required duct to be mounted against ceiling.



The (FA) KLAMPSWITCHFUZ Switchboard from which Plugin (FA) Busduct in photo at left is fed. Feeder (FA) Busduct at left runs to an existing distribution center.



Plugin (FA) Busduct mounted on edge, with Plugin Outlets in cover and opposite side, simplifies the conduit layout in this installation with its varied types of machines.

Clip Minutes – Save Hours!

Minutes clipped from the time required to make machine connections to the power line mean added hours of production.

(FA) BUSDUCT

helps speed production. This modern, flexible method for the distribution of power and light makes it possible to "move the machine—plug in—go!" at any desired position; for Plugin (FA) Busduct provides plug-in openings at 12-inch intervals.

Both Feeder and Plugin (FA) Busduct may be taken down and moved to new locations without appreciable loss of material. Extensions may be made readily to existing installations.

(FA) Busduct is designed for 2, 3 and 4-wire feeder systems; 250 volt DC, 575 volt AC, maximum. Plugin type capacities, 125 to 1,000 amperes; Feeder type, 250 amperes and up.

Investigate this Modern Method of Electric Distribution
Let the (FA) Sales-Engineer show you how it may be applied to advantage — whether in new construction or plant modernization. His long experience will be helpful — and he will be glad to consult with you — without obligation. Write for his name and address — or see listing in Sweet's Catalog (Architectural Section or Industrial-Engineering Section), in Thomas' Register or in Electrical Buyers' Reference.

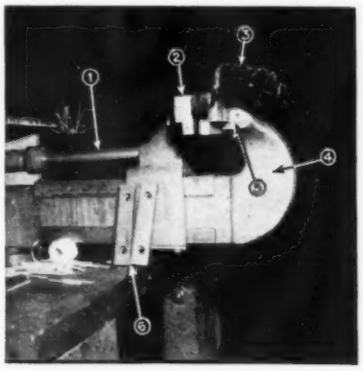
Let us send you Bulletin 65
which gives full details of (FA) Busduct installations, with photographs, diagrams and suggested specifications . . . Frank Adam Electric Company, St. Louis, Mo.

EST. 1891 — THE SIGN OF A BETTER JOB
FA
Frank Adam
ELECTRICAL PRODUCTS
for Defense Industry
FRANK ADAM ELECTRIC CO.
ST. LOUIS, MO. U.S.A.

Motor Shops

[FROM PAGE 76]

The hydraulic plunger (1), which is connected to the movable vise jaws, is operated by a set of three foot pedals. One pedal closes the vise jaws; the second applies pressure to the coil in the vise clamps; the third releases the pressure and opens the vise jaws. The complete unit is mounted on a 2-ft. by 3-ft.



***HYDRAULIC VISE** doubles as a coil press that can be used in the shop or in the field. Salient features are (1) hydraulic plunger, (2) removable coil clamps, (3) coil being pressed, (4) stationary vise jaw, (5) coil clamp mounting angles, and (6) vise jaw plates which are replaced by coil clamps.*

wood bench, 37-inches high. The pedals are mounted on a cross-piece at the base of the bench. For field use, the entire unit can be moved to the job and used to press coils again to fit the slots.

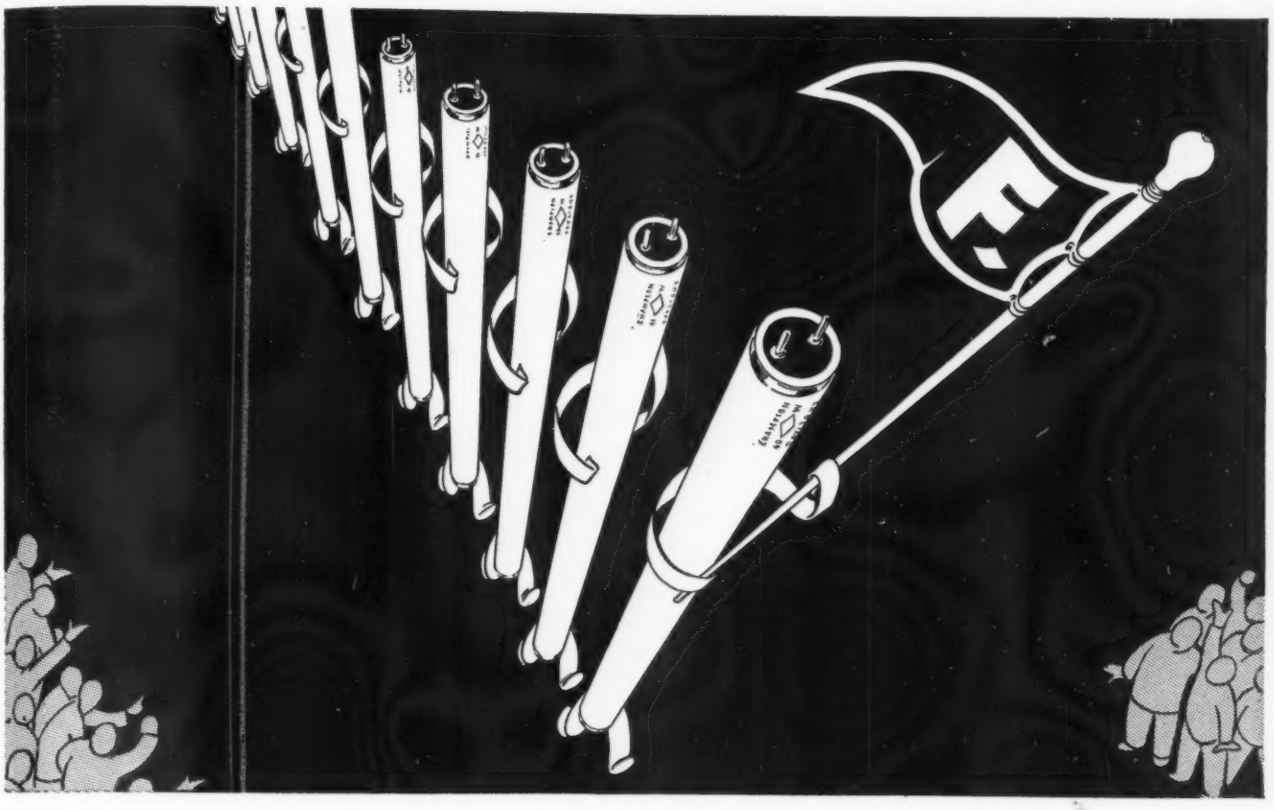
When used in the shop, the unit is placed in front of or near a small oven in which the impregnated coils are heated. The coils are taken from the oven and pressed while hot.

SCRAP COPPER PRESS

The Tri-State Armature and Electrical Works, Inc., enterprising motor service shop in Memphis, Tenn., is doing its part in conserving scrap copper for our war program.

Any magnet wire and other copper conductors that cannot be salvaged for re-use are placed in a firebox and the insulation is burned off. The bare copper is pressed into 150-pound bales and sold to scrap dealers from whence it eventually finds its way into shells and other vital war materiel.

A home-made press, fabricated from some 4-in. channel iron and 2-in. angle iron is used to bale the copper into compact bundles. The five-sided press is 31 in. long, 22 in. deep and 34 in. high.



You Can Count on CHAMPIONS

They're Ready To Refresh And Restore That Potent Production Ally—
GOOD LIGHT AND LOTS OF IT!

Ample lamp reinforcements are needed to win the battle of production.

Make sure you are ready with an adequate, dependable supply of lamp replacements. Good, clean, efficient Fluorescent Tubes and Incandescent Bulbs are more important than ever—these days of 'round the clock operation.

Why CHAMPIONS For Your Replacements?

Because you can be certain of champion performance, however sustained or severe the service. Champion *controlled quality* is backed by forty-two years of specialized experience in lamp manufacture, unsurpassed engineering and testing facilities plus many patented improvements. *And because* the Champion Lamp distributor in your locality has the ability to fill your lighting needs and, with Champion Lamps, to lower your lighting costs.

Write for the new Champion Maintenance Manual containing complete, practical information on how to make the most of your existing lighting installation.

CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

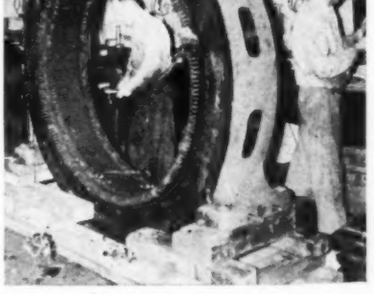
Motor Shops

[FROM PAGE 78]

The channels forming the door, sides and floor of the press are welded to an angle iron frame. Small spacings between the channels permit the insertion of the baling wire.

A screw jack supported by a heavy channel bracket operates the heavy upper pressure plate. After sufficient pressure has been applied, the door is opened, the baling wire tied and the bale removed. The press can take up to 350-pound bales, but for easy handling the bundles are confined to approximately 150 pounds.

***BALING PRESS** reduces scrap copper wire to easy-to-handle, 150-pound bundles at this Memphis motor shop. A few pieces of angle and channel iron, a screw jack and an idea did the trick.*



***LARGE OR SMALL** jobs are taken in stride by Electro Service, Inc., Union City, N. J. motor repair shop. This 400 volt, 200 r.p.m., 36 pole synchronous motor stator dwarfs the mechanic who is taking data for rewinding it.*

"Gramp" YAEGER'S BACK ON THE JOB!

"Gramp" Yaeger's typical of the thousands of skilled old-timers in industry able to continue doing *precision* work . . . if you give them the kind of man-made daylight provided by MILLER *Continuous* Wireway Fluorescent Lighting System . . .

WPB says, "When old-timers are provided with good lighting, tailored to their needs, it is frequently possible for them to keep on doing the precision work for which they are fitted."

MILLER 50 FOOT CANDLER or 100 FOOT CANDLER will provide war industry with fine, man-made *daylight* . . . adequate, productive illumination evenly distributed over every working surface. MILLER TROFFERS will duplicate that performance in plant offices and drafting rooms.

This better lighting will actually make war workers see better, feel better, work better. It will help speed production, cut down spoilage, improve worker morale, reduce accidents, and make for smoother-running plants. It is constructed to effect savings in critical materials . . . in installation time and dollars . . . and to help power conservation.

Just under 100 years of lighting experience . . . working with incandescent, fluorescent and mercury vapor . . . has enabled MILLER to offer through its engineers a lighting "expertness" which is at your command . . . to provide the best type of lighting system for your customers now in war production. *Write or wire us today* and we'll get on the job at once.

BUY U. S. WAR BONDS

MILLER

50 FOOT CANDLER
100 FOOT CANDLER
MILLER TROFFERS
Continuous Wireway Fluorescent Lighting Systems

THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844

● MILLER offers a complete line of filament and fluorescent lighting equipment.

A MILLER Message inspired by WPB's helpful handbook, "Plant Efficiency."

Modern Lighting

CLEANING OFFICE LIGHTING FIXTURES

Lighting equipment in the office is often neglected from the time it is installed until it becomes obsolete. Yet

***INITIAL ILLUMINATION** values can be restored and maintained by regular cleaning of indirect equipment.*

the use of a little softening powder and water for cleaning the equipment will improve the installation materially.

In a month's time the initial illumination of an indirect system may drop 10 or 15 per cent, depending on the surroundings. For a longer period it may fall off as much as 40 per cent. Therefore, all lamps and reflectors should be regularly washed and cleaned, the period between cleanings depending on the locality. Considering average conditions and typical equipment, the units in an office should be wiped off at least once every month and removed for washing every three or four months.

LIGHTING A FOUNDRY

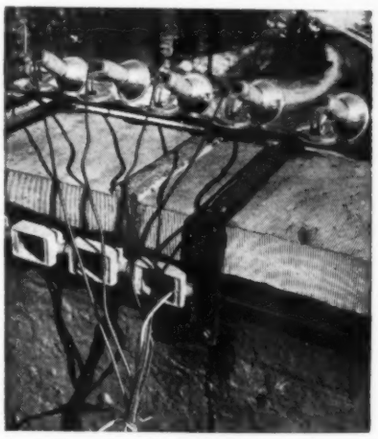
An outstanding example of the way inadequate lighting can be replaced by a superlatively modern system and installed without interrupting essential production is found in an east central aluminum foundry, busy molding the weapons of war. As shown, the former installation consisted of 750-watt filament lamps in conical-shaped dome reflectors on approximately 40- by 70-foot centers. Units were mounted 45 to 60 feet above the floor and provided less than two foot-candles of general illumination. Bare 200-watt clear-bulb lamps on drop cords were employed for supplementary lighting at many work locations and these bright sources were often directly in the field of view and produced serious direct glare.

The new installation consists of 78 3000-watt A-H9 mazda H (mercury) lamps in porcelain-enamel reflectors located on nominal 35- by 40-foot centers, and producing around 35 foot-candles average in service. The units are supported on messenger cable and are located 40 feet above the floor. The bare lamps previously used at the work places are no longer needed.

Each lamp has an auto-transformer ballast located on the steel columns between bays and alternately connected to the separate phases of a 460-volt 3-phase power supply to minimize the stroboscopic effect. Disconnecting hangers help simplify the task of cleaning reflectors at periodic intervals.

PROJECTOR LAMPS FOR PROTECTIVE LIGHTING

Most electrical contractors are familiar with the 150-watt projector lamp which consists of a light source, reflecting surface and lens hermetically sealed into a single optical package. Projector lamps are available in either the spot or flood type of distribution and because the bulb will stand extreme conditions of weather, they are logical tools for



***PROJECTOR LAMPS** on building parapet provide protective lighting of surrounding work or storage areas.*

***BEFORE RELIGHTING,** installation of 750 watt lamps in conical reflectors on 40- by 70-foot centers.*

***AFTER RELIGHTING,** 78 new 3000-watt mercury lamps produce about 35 foot-candles.*

Quicker Production – Better Lighting with Day-Brite Industrial Fixtures

THE DAY-BRITE LINE IS COMPLETE

Factory, Office or Engineering Department Fluorescent Lighting Fixtures of all types — all engineered to fully utilize the higher efficiency of fluorescent lighting.

THREE ADVANTAGES are combined in the Industrial Fluorescent Fixtures comprising the Day-Brite Victory Series: (1) High reflection values and long life are assured by Day-Brite's "Super-White" baked enamel finish on non-metallic reflectors . . . (2) Speed in installation and ease of servicing are achieved through simplified mechanical design . . . (3) Maximum rigidity of the entire installation is assured by truss-like construction.

Call your Day-Brite Engineering Representative.

DAY-BRITE LIGHTING, INCORPORATED
5444 Bulwer Ave. St. Louis, Missouri

DayBrite Rivals Daylight — Adds Victory Hours!

Design Patent No. D-133,458
Other Patents Pending

Day Brite Reg. U. S. Pat. Off.
FLUORESCENT FIXTURES

The **COMPLETE LINE OF FLUORESCENT LIGHTING FIXTURES** *Nationally distributed through all leading electrical supply houses*

HOW WILL THE WPB LAMP LIMITATION ORDER AFFECT YOUR CUSTOMERS?

Every Lamp Dealer will want to know the answers to these questions

1-WHAT IS THE PURPOSE OF THIS LIMITATION? The general purpose of WPB order L28A is to conserve critical materials.

* * *

2-WHAT SIZES AND TYPES OF LAMPS ARE AFFECTED? The lamps that are to be discontinued are types or colors which are not essential either to civilian needs or to the war effort:

In the fluorescent line, colored lamps will be discontinued. Only 3500° White and Daylight lamps will be available.

Among the filament lamps, 10, 15, 25, 40, 60, 100 and 150 watt sizes will be available as before. The following are discontinued:

50 and 75-watt sizes.

Flame tint and colored lamps (except red, green, and blue in certain sizes).

Purely decorative lamps such as flame-shape and some round bulbs.

On voltages, there will also be a simplification. Available voltages will be only 115, 120, and 125.

G-E MAZDA LAMPS

3-WHAT EFFECT WILL THIS HAVE ON INDUSTRY, COMMERCE, HOMES? These changes will work little hardship on homes, offices, stores or factories. Fluorescent lamps in 3500° White and Daylight are the ones which industry needs. Mercury lamps will be available as before. Beside the necessity of good light to speed war production, there will be light for safety in our streets, light for transportation, light in our schools and hospitals, as well as the necessary amount of light in homes and stores and offices.

Homes and stores will have to get along without certain decorative lamps. But the very purpose of this order is to conserve critical materials and, at the same time, to supply the essential needs of war industry and essential civilian needs with as little inconvenience as possible to all concerned.

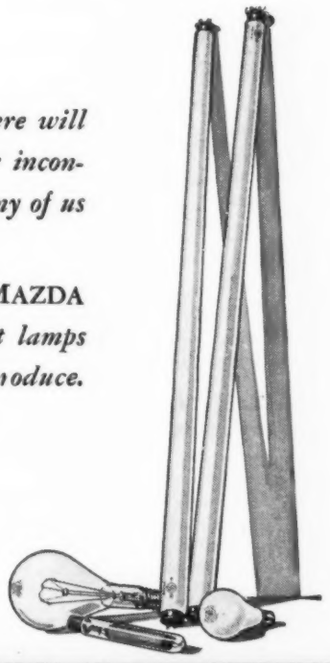
* * *

4-ARE STOCKS OF DISCONTINUED ITEMS STILL AVAILABLE? All discontinued lamps now on our schedules will be available until present stocks are exhausted.

* * *

As the war goes on, it is only natural to expect that there will be fewer types and sizes of lamps available. Whatever inconvenience is involved, however, is a small sacrifice for any of us to make to help win the war.

We, in General Electric, pledge to the users of G-E MAZDA *lamps that we will continue to supply the most efficient lamps that G-E Research and G-E manufacturing skill can produce.*



There's a G-E MAZDA *lamp for every essential lighting need.* MAZDA *is not the name of a thing, but the mark of a research service.*

GENERAL ELECTRIC

Modern Lighting

[FROM PAGE 82]

short- and medium-range protective lighting. In this installation, the two outside units are projector spot lamps aimed at the ground below with three projector flood lamps filling in the center.

Although the use of larger groups of these 150-watt projector lamps as a substitute for conventional floodlighting equipment to expedite temporary installations may not be as economical in the long run, such installations do have the advantages of ready availability, flexibility and reliability. In designing such systems, remember that the projector spot lamp has a beam pattern similar in distribution to a 30-degree beam floodlight while the projector flood lamp is comparable in distribution to the 60-degree higher-wattage floodlighting unit.

BLACKOUT LIGHTING POSSIBILITY WITH FLUORESCENT INSTALLATIONS

Fluorescent lamps, like all electric discharge sources, have the characteristic of failing to remain lighted when the supply voltage is greatly reduced. This principle makes it practical to provide a simple blackout lighting system for fluorescent and mercury installations. As shown, 15-watt inside frosted

***NORMAL VOLTAGE LIGHTS** fluorescent lighting system across which small blackout lamps have been connected.*

filament lamps in suitable small reflectors are fastened to the fluorescent reflector or permanently attached in multiple to the wiring system and spaced in accordance with specifications. The filament lamp is kept operating all the time the fluorescent circuit is on. To effect a blackout, it is necessary only to reduce the line voltage to slightly over 40 per cent of normal, which is insuffi-

Lighting Equipment Bearing These Insignia

Are Helping Thousands of Plants to Meet War Production Quotas

BENJAMIN PRODUCTS

★ ★ ★

INDUSTRIAL
LIGHTING EQUIPMENT
including fluorescent, incandescent and mercury lamp units.

EXPLOSION-PROOF UNITS
DUST-TIGHT UNITS
VAPOR-TIGHT UNITS
FLOODLIGHTING
EQUIPMENT

★

MARINE
LIGHTING EQUIPMENT
MARINE WIRING DEVICES

★

SOCKETS
AND OTHER WIRING DEVICES

★

SIGNAL EQUIPMENT
including Sirens, Horns, Buzzers and Telecode Relays.

★

If you have a problem relating to the use of any of the above products, write the Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Ill., for data and recommendations. Benjamin services in the solution of such problems are available without cost or obligation of any kind.

Good lighting is essential to MORE production*. This fact makes lighting equipment selection, installation and maintenance of first-rate importance to the War effort; because Good Lighting is almost completely dependent upon properly designed, constructed, installed and maintained lighting equipment.*

To provide such lighting equipment for war industries, for America's naval units and shipping and for the protection of industrial and governmental properties against sabotage is

Our Proud Task in this War

To this War task we bring all our resources . . . all our energies . . . all our experience and skill in the design, manufacture and distribution, of industrial, commercial and marine lighting equipment, related electrical products and signal systems.

Summarized here are the five factors which make the name Benjamin on lighting equipment stand for Good Lighting—More Production.

EXPERIENCE. More than forty years of research, development and engineering—the experience gained through thousands of actual plant experiences with lighting and the knowledge of the durability and maintenance requirements for industrial lighting equipment—provide assurance of Good Lighting when you specify Benjamin.

ENGINEERING SERVICE. Benjamin's experienced research and engineering staff and trained field engineers are at your call in surveying and analyzing your requirements; in preparing recommendations, plans and specifications that insure proper installation, operating efficiency, economy.

PRODUCT QUALITY. Benjamin equipment is designed and constructed in conformance with all known electrical, mechanical and illumination standards such as RLM, Underwriters' Laboratories, Electrical Testing Laboratories, National Electrical Code and Bureau of Standards.

MANUFACTURING FACILITIES. Trained personnel and sufficient equipment give assurance that small as well as larger orders are properly handled in accordance with their priority status.

MAINTENANCE SERVICE. Available through Benjamin's nationwide distributor organization, are Benjamin replacement parts and repair services. These services minimize interruptions and inconvenience and help conserve materials by making most unlikely any necessity for replacements of entire lighting units.

**These statements are amply substantiated in research reports and publications of the Illuminating Engineering Society, American Standards Association, governmental and other war agencies and by the experience of electrical and illuminating engineers, and thousands of plant executives.*

BENJAMIN ELECTRIC MFG. CO., DEPT. H, DES PLAINES, ILLINOIS

BENJAMIN TRADE MARK **LIGHTING EQUIPMENT**

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Modern Lighting

[FROM PAGE 86]

cient to keep the flourescent units lighted but brings the small filament unit down to blackout levels. Therefore, the load on the system during the blackout will only be about 4 watts per 15-watt

REDUCED VOLTAGE blackout control drops to 40 per cent extinguishing fluorescents, leaving small incandescents lighted at low brilliance.

unit. The use of a small variable autotransformer at the panelboard is probably the simplest way of controlling this load.

This discussion applies to fluorescent systems that use glow-switch types of starters. Thermal-switch starters will in most cases draw a relatively heavy load even at the reduced line voltage.

A REMINDER ABOUT REFLECTED GLARE

Curved specular work surfaces frequently produce a concentration of reflected glare which is particularly trying on workers' eyes. The condition is worse when the illumination is from a point light source, such as is approximated by a bare incandescent lamp. The rem-

GLARE from bare lamp is reflected from shiny machine surface.

They come up Smiling

Alzak* Aluminum reflectors retain their high reflectivity with surprisingly little attention. Of course they pick up dirt, like any other workers in dusty, smoky surroundings. But their smooth, hard Alumilite finish (process patented) makes cleaning easy and guards against scratching.

Dust them off occasionally, or wash them with a mild soap and water. In some locations, where fumes and dirt conditions are bad, your Alzak reflectors may need extra cleaning care. *How to clean them* is told in the booklet, "Instructions for the Protection and Maintenance of Alumilite Finishes and Alzak Reflectors".

For copies of this booklet, and poster cards carrying similar reminder information for your cleaning squads, write ALUMINUM COMPANY OF AMERICA, 1946 Gulf Building, Pittsburgh, Pennsylvania.

*Registered Trademark

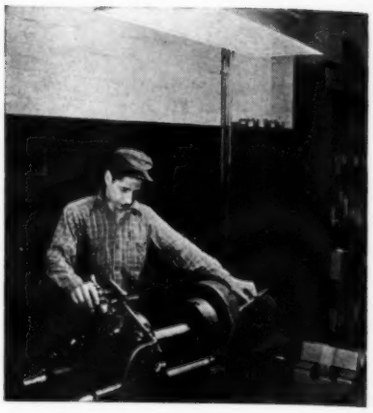
ALCOA ALUMINUM

Modern Lighting

[FROM PAGE 88]

edy lies in sufficiently increasing the area of the light source, as when fluorescent units are properly used.

The photographs show a common variety of reflected glare. This fellow's eyes may be partially shielded from direct glare by the visor of his cap, but the polished convex surface which he is machining produces severe glare and reduces his visibility. The other photograph shows how this situation might have been corrected.



***DIFFUSED** source prevents convex surfaces from reflecting glare.*

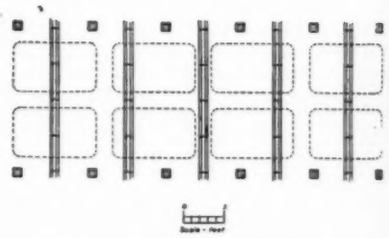
Lighting A WEAVE ROOM *Fluorescent*

PROBLEM—To provide high-level, shadowless lighting on the loom. The woven cloth must be clearly visible to detect possible flaws. The entire loom area must be well lighted to check for bent reeds, lint on the back of the loom and broken ends.

CONSTRUCTION DATA—The room is 54 by 170 feet, and the walls and ceiling are painted flat white.

SOLUTION OF PROBLEM—General illumination is provided by continuous rows of 4-foot RLM fluorescent open porcelain-enamel steel reflectors, designed for three 40-watt white Mazda F lamps. These were originally equipped with two lamps per reflector, thus permitting a 50 per cent increase in illumination at relatively low cost whenever desirable. The rows are spaced on 9-foot centers mounted 9 feet above the floor.

The wiring and high power factor auxiliaries are carried in a continuous wiring channel from which the individual reflectors are detachable for maintenance purposes. Each unit is equipped with a Tulamp ballast which has essentially unity power factor and which minimizes stroboscopic effect.



***LAYOUT DIAGRAM** of lighting units over a portion of the weave room.*

RESULTS—The average general illumination in service provided is 50 foot-candles on the looms.

***CONTINUOUS FLUORESCENT UNITS** providing general illumination in this weave room consist of three lamp four foot RLM units on 9-foot centers 9 feet from floor.*

New ALL NON-METALLIC

INDUSTRIAL FLUORESCENT UNITS

COMPLETE HOOD & REFLECTOR
CONTAIN ONLY OUNCES OF STEEL

UNDERWRITERS LABORATORIES APPROVED

Individual Units for Two and Three 40-watt and Two 100-watt lamps

Designed for the war industry and to save the maximum in critical materials.

From actual use and exhaustive tests by our company and the Underwriters Laboratories, Inc. this fixture has proven to be of rugged construction—fire resistant and water repellent.

Housing and reflector are of non-metallic material and reflector conforms to War Production Board standards "contains less than one pound of steel per fixture".

Here is a fixture that you can recommend and install (not as a substitute for steel) but a fixture that will give you top performance and years of service.

Fixture is Underwriters' Laboratories approved.

This new fixture development contains approx. only 5% of the critical materials used in an all metal fixture and approx. only 10% of the critical materials used in a fixture with a metal housing and non-metallic *reflector. Thus conserving the maximum of strategic materials for the war effort.*

Complete non-metallic fixture is formed and fabricated in our own plant at Highland Park, Illinois, which in return gives you the utmost in precision built equipment with the Underwriters' approval.

All fixtures are finished with our own "Klasium" enamel which is fire resistant and has a reflecting factor of 82% and upwards. A finish proven by years of service.

Already this fixture is performing meritorious service for the Army and Navy under severe service conditions.

WRITE — WIRE OR PHONE ABOUT THIS FIXTURE TODAY

LIGHTING PRODUCTS INC.

HIGHLAND PARK • • • ILLINOIS

EQUIPMENT News

Blackout Lamp

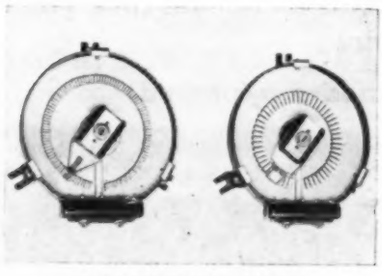
A new blackout lamp designed to provide a quick, easy and economical method of supplying sufficient illumination during blackouts has been announced. The lamp is an A-15 type bulb, coated black except for a one-inch aperture in the bulb end which emits an orange-red light. Having a 14-watt filament, the blackout lamp is available in two voltage ranges; 115-125 volts and 30-34 volts. Sylvania Electric Products, Inc., Salem, Mass.

SYLVANIA BLACKOUT LAMP

■

Rheostats

These pressed steel rheostats have solid rectangular contacts, and are available in small and large sizes. Small rectangular contacts can be furnished on 13-inch or smaller rheostats, and large ones on 8-inch or larger rheostats. Units are available with complete enclosures, fittings for conduit connections, motor drives and with accessories for floor, back-of-board, and concentric mounting. Fixed and adjustable stops to protect control equipment can be provided. Ward Leonard Electric Co., Mount Vernon, N. Y.



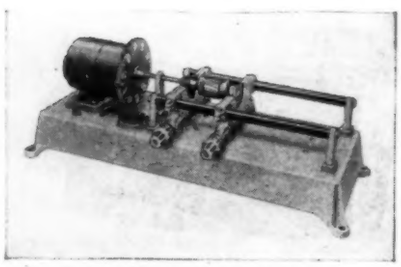
WARD LEONARD RHEOSTAT

G-E BLACKOUT STREET LIGHT

Blackout Street Light

This new blackout street luminaire has been approved by the War Department. Redesigned to meet the revised specifications for American outdoor blackout lights, it provides a lighting intensity equivalent to 1/50 of the illumination of a full moon. It has been built without glass and uses only plastics and iron. Light is supplied by a 9-watt lamp placed in a plastic band. The luminaires are equipped with brackets, and can be installed either on buildings or on wood poles. General Electric Co., Schenectady, N. Y.

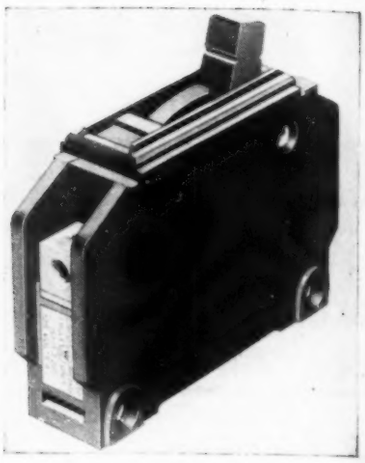
■



BEAR BALANCING MACHINE

Balancer

A new line of Dy-Namic balancing machines is now available. These balancers eliminate the noise and premature wear of shafts, bearings, etc. resulting from excessive vibrations of rotating parts caused by couple action. The balancing machine reveals whether a static or dynamic unbalance, or both, are present without reversing ends of the body being balanced. Machines are available in a variety of models ranging from bench to large floor and pit-type models for balancing such rotating parts as armatures, fans, blowers, fly-wheels, hubs, drums, propellers, gears, impellers, pulleys, wheels, rotors. Bear Mfg. Co., Rock Island, Ill.



WESTINGHOUSE BREAKER

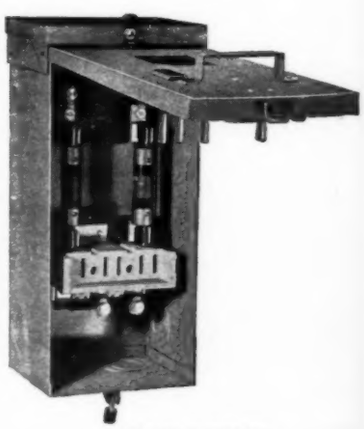
Breaker

This new quicklag nofuze "De-ion" breaker is designed to give practical circuit protection for all kinds of lighting, appliance and fractional motors. It can stop a force equivalent to 230 hp., and gives adequate protection for portable tools and appliances using small wire sizes. It combines in a single unit a cooperative thermal-magnetic trip action. It is available in ratings of 15, 20, 25 and 35 amperes, single pole only, 125 volts a.c. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

■

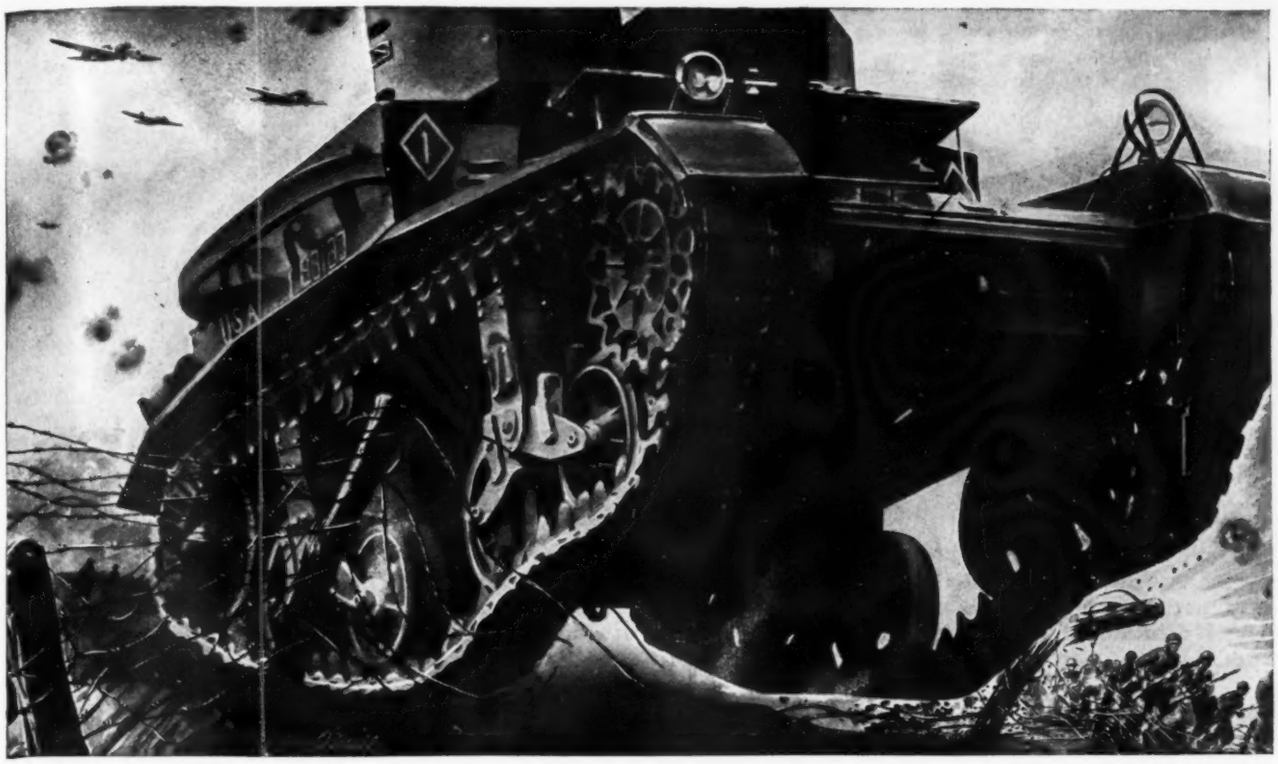
Switches

A new line of shock-proof and drip-proof switches designed for naval and marine applications is now available. The 100 ampere, 3 pole, 575 volt a.c. unit is contained in a cabinet 7¾ by 17¼ by 6¼ in. A catch is at top of cabinet to hold switch in "off" position while replacing fuses or making repairs. When switch is "on" it may be secured by a hexagon nut threaded on a swivel bolt. All devices have standard 250 volt fuse spacings. They are available for either 2 pole, 250 volts d.c. or 3 pole, 575 volt a.c., services with capacities ranging from 30 to 100 amperes. Square D Company, 6060 Rivard Street, Detroit, Mich.



SQUARE D SWITCH

AN ELECTRICAL WHOLESALER HELPS SPEED WAR PRODUCTION



WESCO skill helped tanks roll 58 days quicker

Special Heating Oven Designed, Wired and At Work for Tank Builder in 48 Hours

A Texas Army tank builder needed—double quick—an oven to heat-treat big Diesel Engine connecting rods—300 lbs. at a time. Standard type ovens were either too small or couldn't produce required temperatures. With oven manufacturers' best delivery 60 days, tank production faced a full stop; so the builder brought his problem to the local Wesco House.

Wesco quickly designed a special oven. In 36 hours the tank foundry had built the oven body; in 10 more hours, Wesco Service men had the job completely wired, units placed, thermostatic controls installed and properly calibrated for temperature. As a climax, with only 440 volts available, Wesco ingenuity wired 220-volt elements in series for 440-volt operation. Within 48 hours after the problem was given to Wesco the special oven was in service.

Saving 58 days of costly delay in tank production typifies scores of cases of unique Wesco Service—now devoted to Victory, later to speed peacetime business.

WESCO SPEEDS PRODUCTION

* Within 19 days large quantities of various electrical supplies were delivered to a glider plant by Wesco—best complete delivery by manufacturers was 7 weeks.
* Shipment of 55 miles of conduit for war plan started within 24 hours after Wesco got the order. Best delivery from any other source was 5 weeks to start.

WESCO SERVES BUSINESS

* By warehousing stocks in anticipation of customers' needs.
* By furnishing informative and technical data.
* By providing trained sales and engineering personnel.

Westinghouse

ELECTRIC SUPPLY CO.

150 VARICK STREET · NEW YORK, N. Y.

The name that means everything in electricity

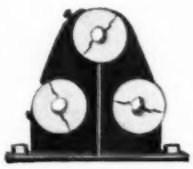
A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

EQUIPMENT NEWS

[FROM PAGE 92]

Cable Rack

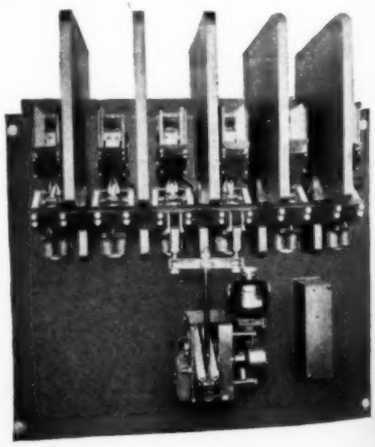
These Type D-F cable racks are of the new non-inductive design. They can be used for either a.c. or d.c. systems as cable is only partially surrounded by metal. Rack is of one-piece construction and is made of certified malleable iron. Lay the cables in openings then slip the bushings into place. The bushings have a partial collar on one end, which pass through slots or openings in rack. Bushings are then rotated into position so small screw will seat in depression, preventing the bushing from rotating. The M. & W. Electric Mfg. Co., Inc., East Palestine, Ohio.



M. & W. CABLE RACK

Air Circuit Breaker

This new high-speed air circuit breaker, Type AG-1, reduces arc back. It removes short circuits in less than one cycle, and limits the current that can flow into the faulty anode to values of less than 50,000 amperes. Its design utilizes the effect of magnetic loop expansion. Where circuit is normal, the increased pressure at contacts prevents burning of their surfaces. But when breaker is tripped during abnormal circuit conditions, the magnetic loop expansion effect helps get the contacts separate quickly. A high speed current directional trip initiates the opening of the contacts. The breaker has an arc chute of the magnetic blow-out type which multiplies the magnetic effect of the current through it and lengths the arc back to its extinguishing point. General Electric Co., Schenectady, N. Y.



G-E AIR CIRCUIT BREAKER

FS-4NB for 40-watt lamps

G-E "MASTER NO BLINK"

FS-6NB for 100-watt lamps

This NEW*
FLUORESCENT STARTER
Saves Time, Power and Materials

It Saves Time

IT SAVES TIME by allowing *instant dead lamp replacements.* It eliminates the "cooling" period required by automatic starters when a new lamp is being inserted in the fixture.

It Saves Power

IT SAVES POWER by eliminating *all* flow of current from the ballast under dead lamp conditions. The G-E "Master No Blink" does not require current to keep the dead lamp from blinking.

It Saves Materials

IT SAVES MATERIALS by reducing the number of replacement starters. The G-E "Master No Blink" will outlast all other fluorescent starters.

THE FACTS ARE IN THIS MANUAL

Full particulars—how the "Master No Blink" operates and how it saves you money—are in this new catalog on Fluorescent Accessories. You can get a copy by writing to Section GR-1122-8, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

***A new product today can be justified only if it contributes directly to the war effort. That is the sole aim of the G-E "Master No Blink" Fluorescent Starter.**

GENERAL ELECTRIC

EQUIPMENT NEWS

[FROM PAGE 94]

Instrument

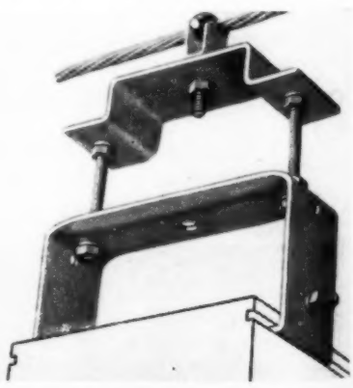
These chronometric tachometers, Type DS, are designed for double speed ranges. These instruments combine a revolution counter and chronometer which times the period of test. Available in two basic models—No. 2301 covers all speeds up to 10,000 rpm. and No. 2302 covers all speeds up to 1000 rpm. Both the high speed and low speed tachometers are available in three models with various accessories. The model illustrated is suitable in cases where feet per minute requirements are not necessary. Herman H. Sticht Co., Inc., 27 Park Place, New York, N. Y.

STICHT TACHOMETER

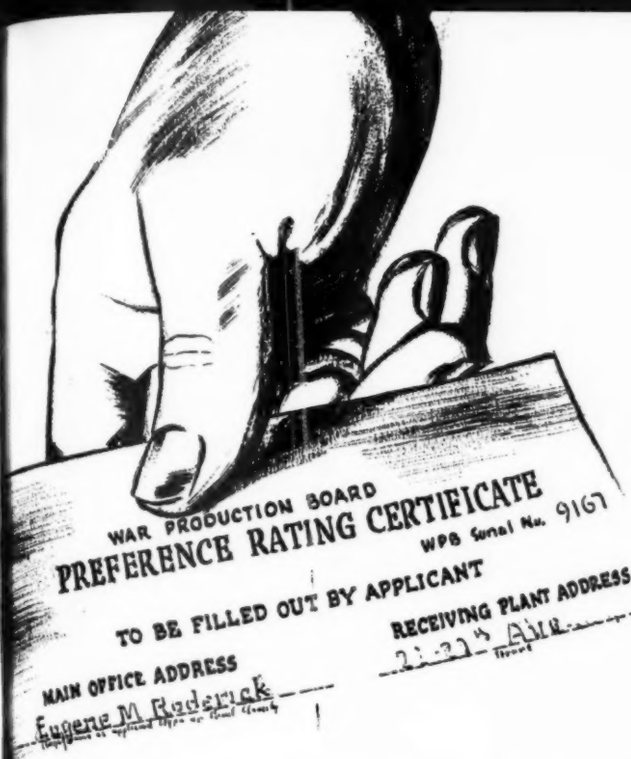
■

Fixture Mounting Device

Slide-grip hangers are now put on all Sylvania continuous-row industrial fluorescent fixtures. These adaptable mounting clamps provide faster installation and easier maintenance, it is claimed. Mount the slide-grip hangers first, then lift fixtures section by section and snap them into place. This device offers a variety of applications for chain, surface, rod or messenger-cable mounting. Sylvania Electric Products, Inc., Ipswich, Mass.



SYLVANIA FIXTURE MOUNTING DEVICE



Here is your *right* to buy

—and here is the way to make it easier

You've just landed that big war order. It's a huge one . . . it will keep your plant humming for some time to come.

Your problem now is how to meet that deadline.

There are some changes necessary on your equipment. . . . Like explosion-proof motors, for instance. You know that the inflammability of the product you will manufacture will not permit the use of motors that spark.

You are familiar with several companies that make and sell motors. . . . But do they have motors for hazardous locations?

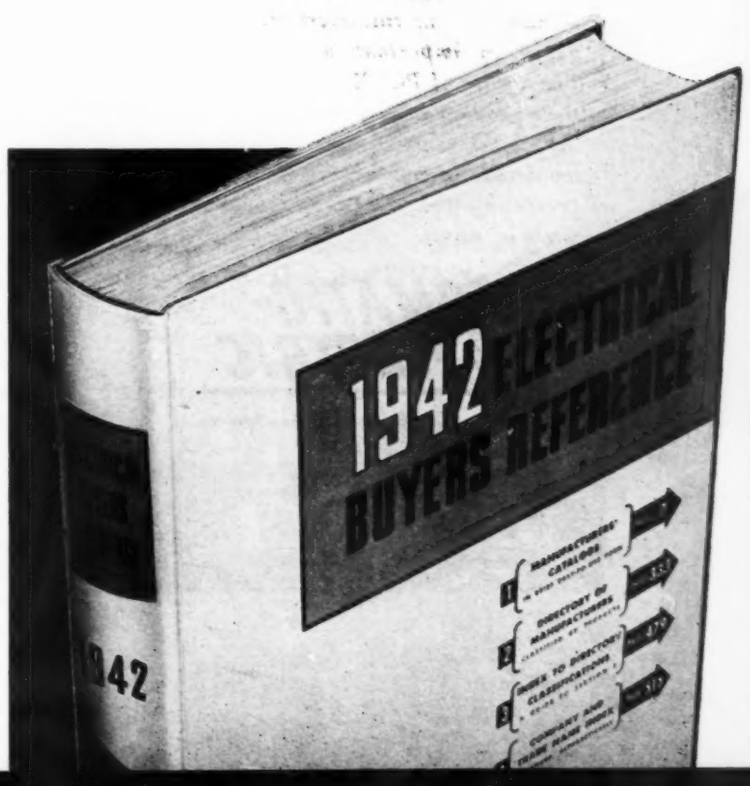
Here's an easy answer.

Reach for the *Electrical Buyers Reference*. . . . Turn to the heading "MOTORS" in the Directory Section. Under the twenty different motor classifications you quickly locate "Motors — Hazardous Locations." Six of the manufacturers are in bold face type, with a page number referring you to the BRIEFALOG* Section in the front of the book, where you find detailed catalog data giving the information you need to compare, specify and buy.

This is one of the many ways E-B-R can save you trouble.

Old timers habitually use E-B-R BRIEFALOGS for their buying and specifying of electrical products.

Newcomers in the field will find the BRIEFALOGS a speedy means of reaching a purchasing decision.



* Briefalog: The modern method of cataloging—with condensed descriptions and specifications on all products plus branch office, distributor and warehouse addresses for quick follow through.

ELECTRICAL BUYERS REFERENCE

A McGraw-Hill Service

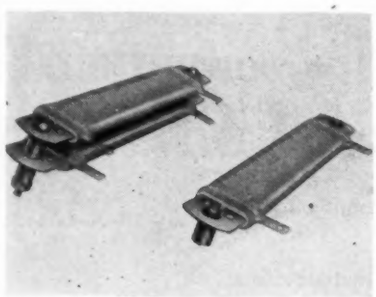
330 WEST 42nd STREET NEW YORK

EQUIPMENT News

[FROM PAGE 96]

Resistors

These vitrohm strip resistors are designed for applications in aviation, radio and installations where space limitations and high unit space watt ratings are requirements. Each unit is fitted with a self-sustained mounting bracket and spacer. These spacers and end brackets are riveted to metal strips that extend through the core providing additional heat radiating facilities. Several sizes are available, ranging from 1½ to 6 inches in length with ratings of 30 to 75 watts. Ward Leonard Electric Co., Mount Vernon, N. Y.



WARD LEONARD RESISTOR

■

Fluorescent Service Light

This new adjustable portable fluorescent service light has been developed for industrial uses. It is adjustable from 30 inches to seven feet. It can be used indoors or outdoors. Upward or downward, horizontally or vertically, or in any angle of a 180° arc, the unit is adjustable without the use of tools. A well-balanced cast iron base makes light difficult to upset. Other features include power factor correction for two 48-in. 40-watt fluorescent lamps; baked enamel reflector and if desired, a screen to protect lens. Lumidor Manufacturing Company, Los Angeles, Calif.

LUMIDOR FLUORESCENT LIGHT

LEADER URC WAR-HOOD

Reflector

These new reflectors are known as the URC War-Hood and are for localized light sources. They are made of a hard-surfaced fibre board. The ballasts are mounted exterior to the wiring channel, using the back-connected type. It accommodates four 40-watt fluorescent lamps. Length is 8 feet, width 23 inches, depth 13½ inches. It operates on 60 cycle, 120 volt, alternating current. Knockouts for No. 14 BX connection are at both ends of the hood. Two, 8 feet long rod hangers are supplied with each fixture. Leader Electric Mfg. Corp., 832 West Superior St., Chicago, Ill.

■

Controller

This new solenoid-operated oil switch is for use with constant current transformers energized from distribution systems up to 7620 volts. It has 15 kv. class insulation. Switch was designed primarily for use on protective lighting circuits served from distribution systems operating at voltages up to 7620/13,200 Y. The principal parts of the design are the same as those of other Novalux controllers, but larger bushings and more internal insulation are used. General Electric Company, Schenectady, N. Y.

■

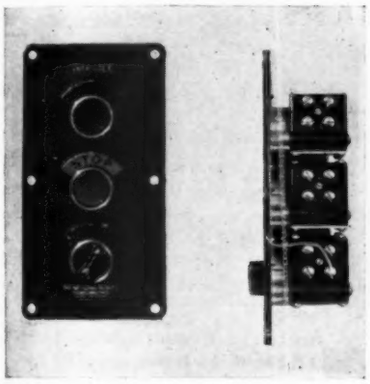
ERGOLYTE WELDER

Welder

A new heavy duty air-cooled arc welder, known as the 250 F., has been developed for high duty mass production welding. It contains a built-in cooling system. It handles an electrode from ⅛- to ⅜-in., has 24 heat steps, an input voltage of 230 volts and a current range from 15 to 250 amperes. The 250 F. has a 60 cycle frequency and operates on a single phase or one phase of a two or three-phase current. Ergolyte Manufacturing Company, Lawrence Street at Erie Avenue, Philadelphia, Pa.

Switch

A new line of heavy duty "Snap-Lock" control station switches has been developed. All parts are interchangeable and readily adaptable to multiple assembly for use in connection with magnetic motor starters or any normal control circuit. Standard assemblies consist of three, two or one button combinations furnished either in flush type for mounting in standard cavity or box type for surface or pendant mounting. Push or turn type station buttons are optional. If you care to make your own applications, special screws, mounting brackets, buttons and indicia can be furnished. The National Acme Company, East 131st St. and Coit Road, Cleveland, Ohio.



NATIONAL ACME SWITCH

■

Autotransformer

A new autotransformer has been developed for airport lighting control. It permits control-tower regulation of runway and contact lights to any one of five degrees of brightness, making it easy to reduce the range at which an airport can be spotted by enemy planes and yet supply enough light for incoming friendly planes. With the new 5-tap transformer, 100, 30, 10, 3 or 1 per cent of normal brightness can be obtained. Autotransformer is energized by a standard Novalux series constant-current transformer. By means of remotely operated tap-changing switches, the constant current supplied to autotransformer can be reduced to predetermined current value corresponding to brightness desired. General Electric Company, Schenectady, N. Y.

G-E AUTOTRANSFORMER

In the News

THIRD EMERGENCY CODE MEETING HELD

The Emergency Committee of the Electrical Committee held its third meeting in New York, September 10. The following action was taken. Interim Amendment No. 69, adopted at the meeting of the Emergency Committee of August 4 (which gave recognition to the new Type EI insulation for ungrounded conductors in dry places in exposed work and in nonmetallic sheathed cable run exposed) was reconsidered by the Emergency Committee as to use (1) in concealed knob-and-tube work; (2) as the ungrounded conductor in nonmetallic sheathed cable used in concealed locations; and (3) in lead sheathing.

After a lengthy discussion the three items listed above were each submitted to vote. A motion to recognize Type EI insulation for the ungrounded conductor in concealed knob-and-tube work, was not adopted. It was understood that when information is received as to Federal Housing Authorities' views, the subject may be taken up again.

A motion to recognize Type EI insulation for the ungrounded conductor of nonmetallic sheathed cable when concealed, was not adopted.

The consideration of Type EI insulation under lead sheathing, resulted in the approval of the following revision of Interim Amendment No. 69, adopted at the second meeting, August 4. (Omitting the last sentence of that text and adding two sentences.)

INTERIM AMENDMENT NO. 69. Section 3005, 1940 National Electrical Code. Approved August 4, 1942, revised September 10, 1942.

Add a note to section 3005 of the 1940 National Electrical Code, to read:

To assist in conserving rubber, and for the duration of the emergency, conductors with emergency insulation (Type EI) may be used as the ungrounded conductor for nonmetallic sheathed cable run exposed and for open wiring on insulators under the following conditions: (1) in dry locations only; (2) for voltages not exceeding 600 volts; (3) if there are more than four conductors larger than No 10 in an outlet or junction box, or in a cabinet or cutout box, the conductors must be individually wrapped with non-combustible, insulating tape. Type EI conductors shall not be used in any hazardous location except as provided for open work in section 5075. When in damp or wet locations, conductors with emergency insulation with lead covering, Type EIL, may be used in accordance with section 3035.

Inherent overheating protection of motors was discussed at the second meeting of August 4. The secretary was then instructed to communicate with Chairman Kennedy of the Article 430 Committee as to the advisability of approving the committee report on section 4322 as an interim amendment. Chairman Kennedy recommended such action, but suggested that the wording as proposed in the Article Committee report be checked by the Codes and Standards Committee of NEMA.

Member Adams, for this committee, made suggestions for a revision of the proposed working, such revision being editorial and not changing the intent.

On motion of Member Mahan the revised section 4322, paragraphs a and b, as appearing in the published Article Committee reports, were approved as an Interim Amendment.

Member Shepard reported that the War Production Board was attempting to obtain a more complete use of the available horsepower capacity of motors, and to assist in this effort recommended the addition of the following to the second sentence of paragraph 4322-a of the Article Committee reports: "except that a 40 degree, open type alternating-current motor may have overcurrent protection not greater than 135 per cent of the full-load current rating of the motor." The meeting approved this addition.

These two actions were combined into the following Interim Amendment:

INTERIM AMENDMENT NO. 72. Section 4322, paragraphs a and b, 1940 National Electrical Code. Approved September 10, 1942.

Section 4322. Continuous Duty Motors.

Revise first paragraph to read: "A continuous duty motor, etc."

Paragraph a. Revise to read:

a. More Than One Horsepower. **A continuous duty motor rated more than one horsepower shall have running overcurrent protection not greater than 125 per cent of the full-load current rating of the motor. This protection may be secured by either of the following means:**

1. **A separate overcurrent device which is responsive to the motor current.**
2. **A protective device integral with the motor which shall be responsive to motor current or both to motor current and temperature. This device must be approved for use with the motor which it protects; it must prevent overheating both of the motor and of conductors to it of sizes specified in section 4312 due to motor overload or failure to start; and it must disconnect the motor from the line under prolonged overcurrent equal to 125 per cent of the full-load**

"She's Smith's new helper."

Release CRITICAL MATERIALS

The materials which enter into a Porcelain Protected Wiring System will, with skilled workmanship, provide the utmost in safety and permanence. Competent design and layout will provide the best adequacy standards at low cost.

Electric Porcelain materials for interior wiring are carefully designed for speedy installation by skilled mechanics and are readily adaptable to all conditions encountered on the job. The manufacturer of electrical porcelain can maintain the highest standards of insulation, adaptability, and rugged design, but important installation factors such as conductor spacing and grouping, neutral identification, grounding, and circuit adequacy are directly under the control of the electrical contractor.

Modern Porcelain Protected Wiring is the only wiring system which gives the electrical contractor full independent control over the electrical characteristics and workmanship of his installation. It offers the contractor the widest opportunity to express his skill in installation, layout, and design for safer and more adequate systems.

TO release more vital metals for Victory purpose, contractors must devote their energies to wiring with the least possible use of critical materials.

The Army and Navy Munitions Board, in its latest booklet on "Prohibited Items for Construction Work" says, "The minimum type of wiring without metal boxes, tubing, or conduit shall be used. Individual conductors shall be supported as in the usual knob and tube systems except solidly grounded conductors may be fastened directly to the building." The following is also said, "Electric Outlet Boxes and Accessories are permitted only to the extent that nonmetallic materials cannot be used or are not available."

●

MODERN PORCELAIN PROTECTED WIRING SYSTEMS

★ ILLINOIS ELECTRIC PORCELAIN CO.
Macomb, Ill.

★ KNOX PORCELAIN CORPORATION
Knoxville, Tennessee

★ PORCELAIN PRODUCTS, INCORPORATED
Findlay, Ohio

[FROM PAGE 100]

current rating of the motor in an ambient temperature of 40C, except that a 40 degree, open type, alternating-current motor may have overcurrent protection not greater than 135 per cent of the full-load current rating of the motor. If the motor-current interrupting device is separate from the motor and actuated by a protective device integral with the motor, it must be so arranged that opening its control circuit will disconnect the motor from the line. The protective device together with any associated equipment shall conform to the provisions of sections 4327 and 4328.

Note. The present fine-print notes are to be continued.

Paragraph b. Revise to read:

b. One Horsepower or Less — Manually Started. A motor of one horsepower or less which is manually started and which is in a location within sight of the operator, shall be considered as protected against overcurrent by the overcurrent device protecting the conductors of the branch circuit. This overcurrent device shall not be larger than that specified in Table 20, Chapter 10, except that such a motor may also be used at 125 volts or less on a branch circuit protected at 20 amperes. Any such motor which is in a location out of sight of the operator shall be protected as specified in sub-paragraph c for automatically-started motors.

Note. Paragraphs c, d and e are retained without change.

Transformer Type Arc Welders

Interim Amendment No. 58, which involves a new section 3816 on Transformer Type Arc Welders, was submitted to the Electrical Committee for mail ballot as an Interim Amendment on June 3, 1942. It was later amended and approved at this meeting.

MIELKE, INC., *has a father-and-son combination that is hard to beat. Warren Mielke (left) is following rapidly on the heels of his dad, Frank M., and is taking to the motor service business like a duck to water. Now "Pop" can leave his Duluth, Minn. shop more often for a trip to the country.*

INTERIM AMENDMENT NO. 58. New section 3816, 1940 National Electrical Code. Approved September 10, 1942.

Insert a new section to read:

3816. Transformer-Type Arc Welders. Switches used for the control of transformer type arc welders shall be of the motor-circuit type for a motor having a full-load current corresponding to the rated full load of the welder; except that for welders having a power-factor corrected to at least 75 per cent, general-use switches having ratings not less than twice the full-load current rating of the welders may be used. The switch may be part of the complete assembly or may be an externally-operated type installed within sight of the welder.

Federal Specifications

At the meeting of August 4, Mr. Shepard brought up several items now before the Federal Specifications Committee. He was asked to report on these items at the meeting of September 10.

The first item had to do with the thickness of rubber insulation on No. 8 flexible cords. After discussion the following interim amendment was approved.

INTERIM AMENDMENT NO. 73. Section 94001-b, 1940 National Electrical Code. Approved September 10, 1942.

Revise the table in 94001-b of the 1940 National Electrical Code to read:

Wire Size AWG	Thickness Inches
18 and 16	1/32
14 to 8	3/64

A motion to amend section 4007 to recognize Nos. 20, 18 and 16 flexible cords with 1/32 inch insulation for voltages up to 600, received no support.

A proposal was made to increase the allowable carrying capacity of weatherproof wires as shown in Table 2 of the 1940 National Electrical Code by 20 per cent. A question was raised as to effect upon the saturating compounds with these increased currents. Mr. Brandon was asked to investigate the matter and to report at the next meeting of the Emergency Committee.

Report was made of the manufacture and rather extended use of a special drop cable for supplying machine tools from busways, this construction being in apparent conflict with section 3646 of the Code, such construction being acceptable only for portable appliances.

A motion to delete from section 3646 the words "for portable appliances" which appears in the fourth and fifth lines, was lost. The discussion indicated that the construction described could be accepted by an inspection authority under a broad interpretation of the definition of "Portable Appliances" as given in Article 100.

Feeders for Ranges

The subject of feeders for electric ranges was brought up by Member Brand through a letter from W. Weinerth, a member of the Electrical Committee. The subject becomes of special urgency through the War Production Board of release of a number of ranges that may be used on existing

ENTERPRISING *Chester R. Robbins, Robbins Electric Co., Moline, Ill., has an up and coming contracting business —coming up so fast that he recently had to move into larger quarters.*

installations. After a discussion the proposal of Article 220 Committee on new paragraph 2203-d, as contained on pages 15 and 16 of the Article Committee reports, was made the subject of the following Interim Amendment.

INTERIM AMENDMENT NO. 74. Section 2203-c, 1940 National Electrical Code. Approved September 10, 1942.

Insert an additional note following paragraph c of section 2203 of the 1940 National Electrical Code to read:

In lieu of Table 29 the load, for all ranges rated more than 1650 watts and not more than 12 KW, may be calculated on the basis of:

1 range	7,000 watts
2 ranges	11,000 watts
3 ranges	14,000 watts
4 ranges	17,000 watts
5 ranges	20,000 watts
6 to 40 ranges	15,000 watts plus 1,000 watts for each range.
41 and over	30,000 watts plus 750 watts for each range.

For ranges having ratings in excess of 12 kw., 5 per cent additional shall be added to above values for each additional kw. of rating or major portion thereof.

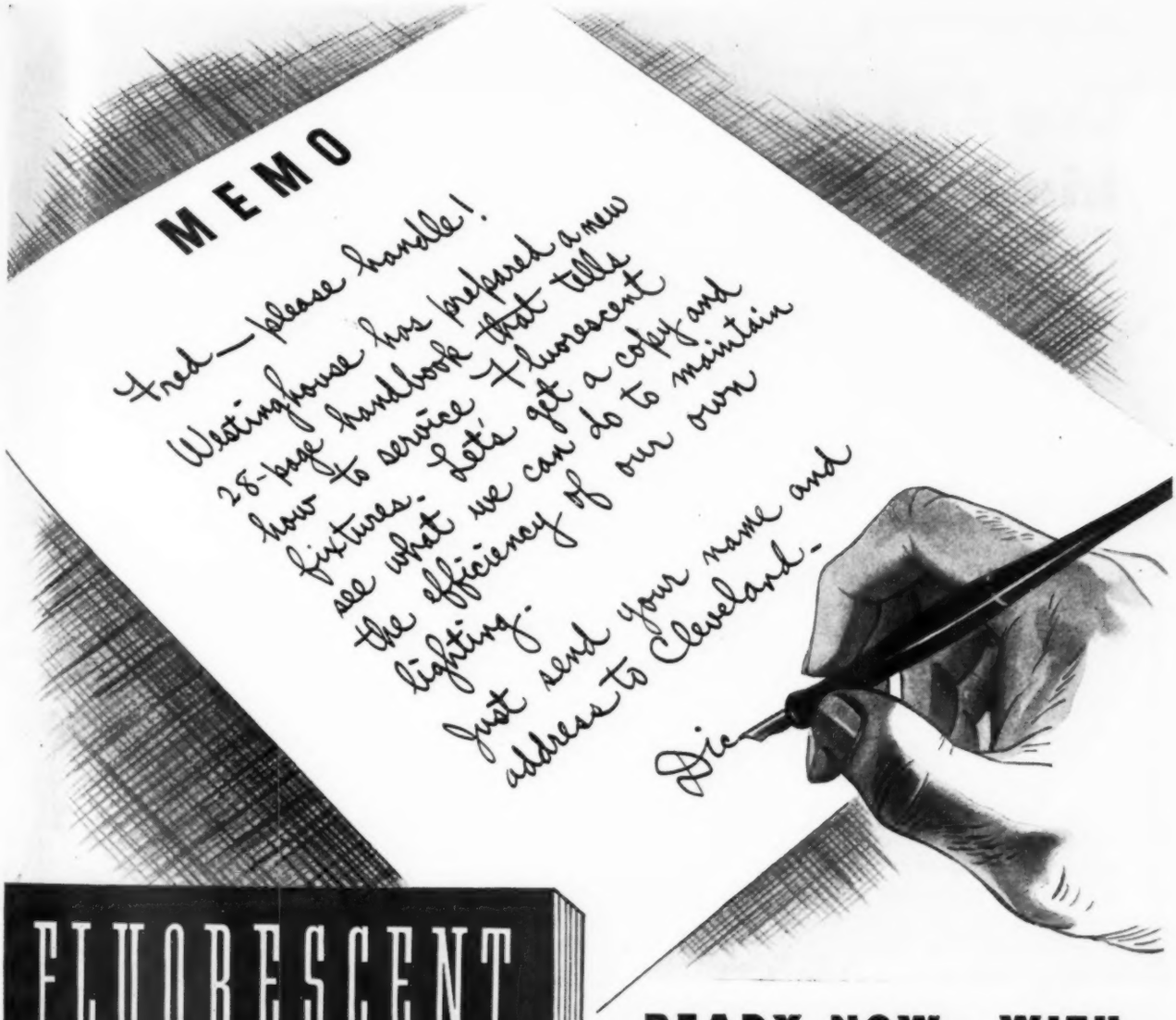
Insulation of Service Drops

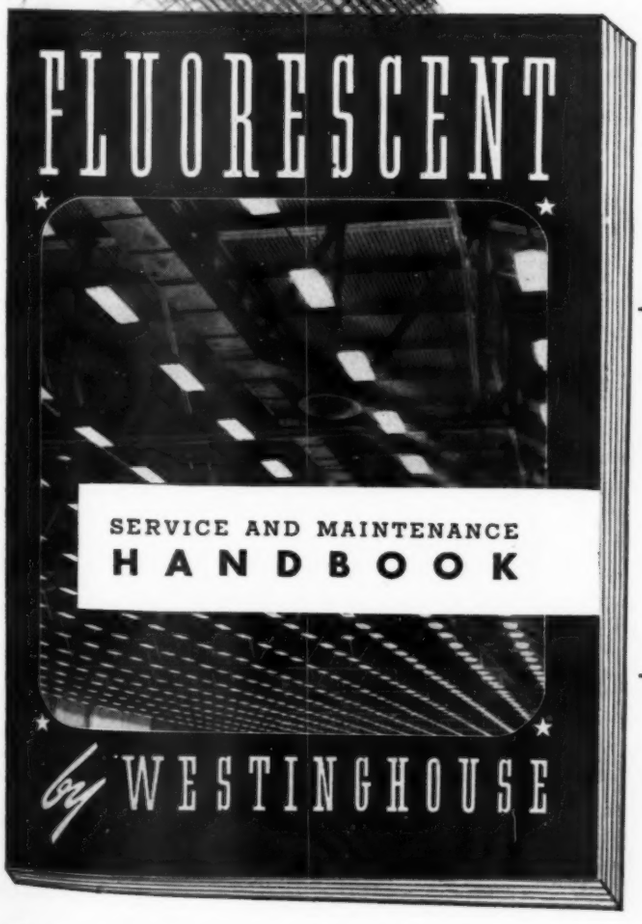
In a letter to the Emergency Committee from Member Brand, the difficulties of the utilities in obtaining insulated conductors for service drops was described. After a discussion of the points involved, the following Interim Amendment was approved by the Emergency Committee.

INTERIM AMENDMENT NO. 75. Section 2304-c, 1940 National Electrical Code. Approved September 10, 1942.

Revise paragraph c of section 2304 to read:

c. *Service Drops.* Except as provided in subparagraph a, service drop conductors in multiple-conductor cables shall be rubber-covered. Open individual conductors shall be rubber covered, or weatherproof (Type WP) wherever within 10 feet of the building, except that grounded open individual con-





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Edgewater Park, Cleveland, Ohio

Please send me a copy of the new Fluorescent Service and Maintenance Handbook — B-3155.

Name and Title _____

Company _____

Street and Number _____

City _____ State _____

Westinghouse

LIGHTING EQUIPMENT

In the News

[FROM PAGE 102]

ductors may be bare to the point of attachment to the building.

Mr. Shepard brought up for the War Production Board the subject of the overcurrent protection of branch busways and proposed as an interim amendment the adoption of the new section 3647 as it appears on pages 44 and 45 of the Article Committee reports. This was approved by the Emergency Committee.

INTERIM AMENDMENT NO. 76. New section 3647, 1940 National Electrical Code. Approved September 10, 1942.

Insert a new section 3647 to read:

3647. Overcurrent Protection of Busways. **Busways shall have overcurrent protection in accordance with their rated current-carrying capacities except as follows:**

a. Rating of Overcurrent Devices. **If the allowable current-carrying capacity of the busway does not correspond to the standard sizes or ratings of overcurrent devices, the next larger size or rating may be used, but not exceeding 150 per cent of the allowable current-carrying capacity of the busway.**

b. Branch Busways. **Overcurrent protection may be omitted at points where busways are reduced in size, provided the smaller busway has a current rating at least one-third that of the rating or setting of the overcurrent device next back on the line and provided further that such busway is free from contact with combustible material.**

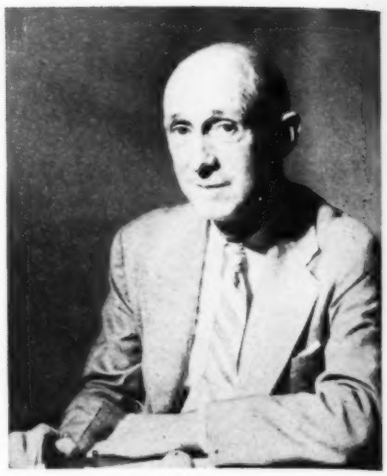
Note. Present section 3647, as in the 1940 Code is retained but with number 3648 and present section 3648 becomes No. 3649.

"JERRY" WESTON JOINS NECA STAFF

Gerald W. Weston, better known to a wide circle of friends in the electrical industry as "Jerry" Weston, has been appointed as Assistant to the General Manager of National Electrical Contractors Association, taking up his duties at the NECA headquarters office in New York on November 1st, 1942.

Mr. Weston has been for nineteen years Secretary-Manager of The Electric Association of Kansas City, which has been one of the leading electrical leagues of the country in development and promotional work, particularly in the promotion of Red Seal adequate wiring. Under Mr. Weston's direction The Electric Association of Kansas City has promoted successful electric and radio expositions, refrigeration shows and cooking schools and conducted cooperative advertising campaigns.

Mr. Weston was for seven years, from 1916 to 1923, Executive Secretary of a national association of woodenware manufacturers with headquarters in Chicago, and left that organization to take up the position of Executive-Manager of the electric league in Kansas City. Mr. Weston has served as President of the International Association of Electric Leagues, has been a member of the board of directors of that organization and was re-elected a director at the recent meeting of the IAEL in Cleveland.



G. W. WESTON

Mr. Weston is a graduate of Purdue University in electrical engineering, and has completed courses in modern business, sales and sales analysis, accounting and commercial law and public speaking. He has taken an active part in Chamber of Commerce and other civic activities in Kansas City.

At a meeting of the Greater Kansas City Chapter, NECA, which was held on October 8, Mr. Weston was presented with a Hamilton wrist watch as a token of the esteem in which he is held by the electrical contractors in Kansas City.

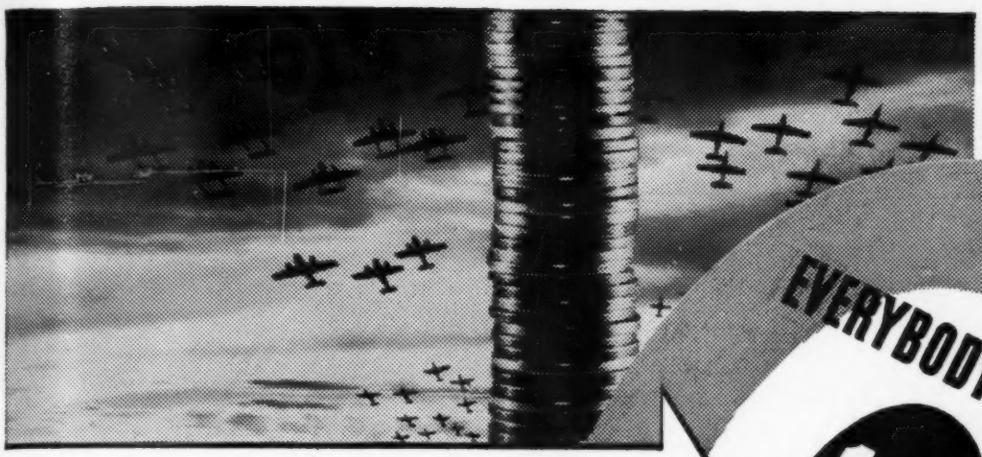
PREISS APPOINTED NECA REPRESENTATIVE

Emil Preiss, who has for many years been a representative of the electrical contractors in New York City, has been appointed as NECA Field Representative for the northeastern territory, which includes the New England States, New York, New Jersey and the eastern half of Pennsylvania.

NECA now has three field representatives, including W. J. Varley for the western territory and Dwight L. Casey for the southeastern territory, under the direction of Paul M. Geary, NECA Field Supervisor.

JOINT COMMITTEE OF ELECTRICAL AND MECHANICAL TRADES

In accordance with a resolution adopted at the NECA Convention at Bigwin on September 3rd, 1942 authorizing the appointment of a committee of three members from the National Electrical Contractors Association, to serve with similar committees of three members each from the Heating, Piping and Air Conditioning Contractors National Association and the



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EVERYBODY 10% EVERY PAYDAY

TO WIN THIS WAR, more and more billions are needed and needed fast—AT LEAST A BILLION DOLLARS A MONTH IN WAR BOND SALES ALONE!

This means a *minimum* of 10 percent of the gross pay roll invested in War Bonds in every plant, office, firm, and factory in the land.

Best and quickest way to raise this money—and at the same time to "brake" inflation—is by stepping up the Pay-Roll War Savings Plan, having every company offer every worker the chance to buy MORE BONDS.

Truly, in this War of Survival, VICTORY BEGINS AT THE PAY WINDOW.

If your firm has already installed the Pay-Roll War Savings Plan, *now is the time*—

1. To secure wider employee participation.
2. *To encourage employees to increase the amount of their allotments for Bonds, to an average of at least 10 percent of earnings—because "token" payments will not win this war any more than "token" resistance will keep the enemy from our shores, our homes.*

If your firm has not already installed the Pay-Roll War Savings Plan, *now is the time to do so.* For full details, plus samples of result-getting literature and promotional helps, write, wire, or phone: War Savings Staff, Section E, Treasury Department, 709 Twelfth Street NW., Washington, D. C.

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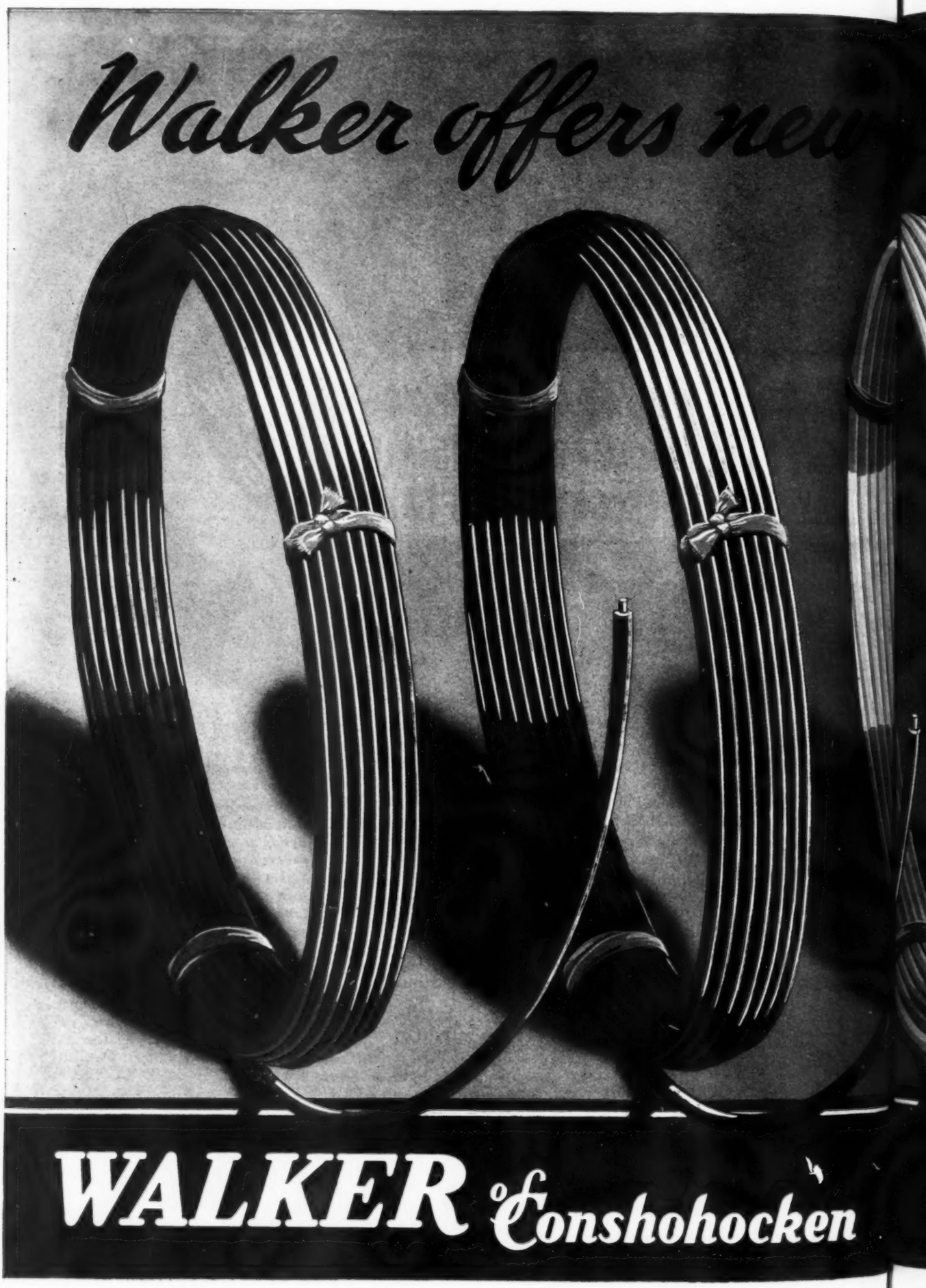
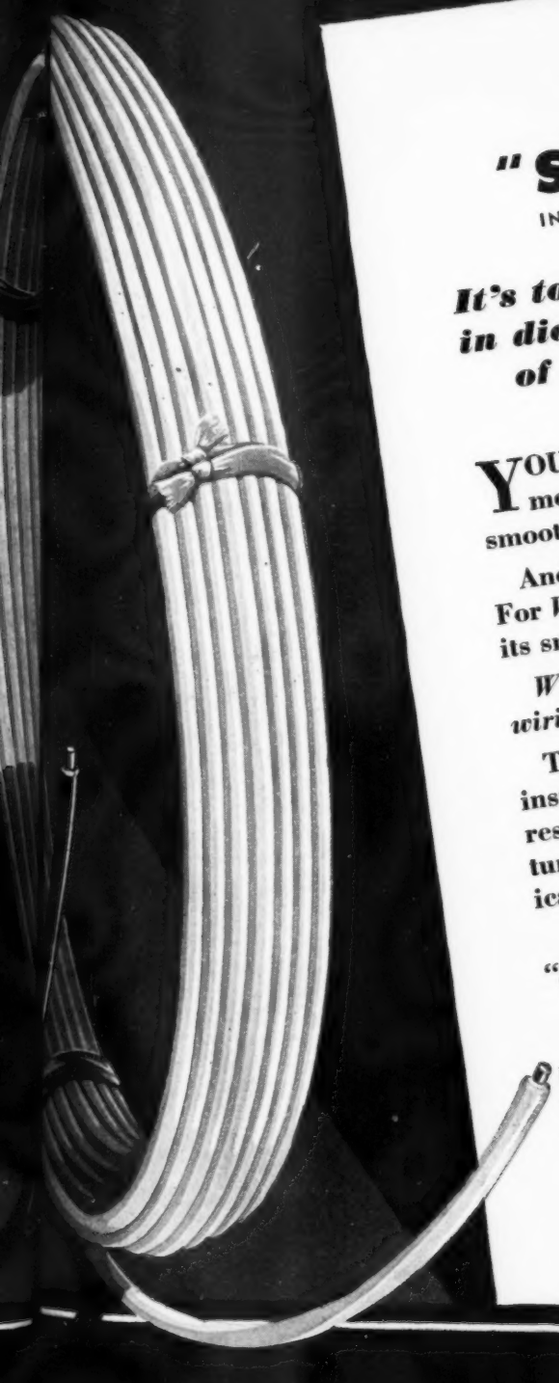

Walker offers new
WALKER of Conshohocken



WALKER "SYNTHETIC"

INSULATED WITH THERMO-PLASTIC RESINS

It's tough! It's flexible! It's high in dielectric strength! And—best of all!—It's easy to handle!

YOU are sure to like *Walker* "*Synthetic*" the moment you see it and feel it. It's so clean and smooth and glossy! So bright and colorful!

And you'll like it even better when you use it. For *Walker* "*Synthetic*" *strips freely* and—due to its smooth, slick surface—it *pulls easily.*

Walker "*Synthetic*" *can save you time on every wiring job!*

There are other outstanding advantages. The insulation is tough and long-aging. It is unusually resistant to heat, oils, alkalies, acids, and moisture. And it has high dielectric and high mechanical strength.

And so we say: Next time—use *Walker* "*Synthetic*". It will help you do a better job!

* * * * *

Walker "*Synthetic*" may be had in all standard colors—black, white, red, blue, yellow, green—and in practically any other shade desired. What's more—these colors won't scuff off!

Sizes range from small diameter building wires up to large circular mil. cables. (18 gauge to 500,000 circular mils.)

Write for prices or talk with one of our field representatives. Walker Bros., Conshohocken, Pa.

In the News

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National Association of Master Plumbers, President McChesney has appointed the following committee to represent NECA: A. Herrmann Wilson, Chairman, Washington, D. C.; O. F. Wadleigh, Indianapolis, Indiana; Grover C. Burke, Seattle, Washington.

This committee will assist in solving the many mutual problems that confront the electrical and mechanical specialist contractors during the present emergency and probably during the post-war period.

NEW ENGLAND MOTOR SHOPS ORGANIZE

At the invitation of A. L. Brown, A. L. Brown Associates, Worcester, Mass., and president of NISA, members of the motor service shop fraternity in the New England area recently attended an organizational meeting in Boston. The result was the formation of a New England motor shop group which will be affiliated with the National Industrial Service Association. An intensive drive for membership is now under way.

At a subsequent meeting the following officers were elected: Paul L. Keating, Electrical Installation Co., Boston, president; F. S. Ferris, Boston, secretary-treasurer. Members of the Board of Directors are Geo. Williams, Springfield, Mass.; N. E. Smith, Fall River, Mass.; and P. E. Stultz, Westbrook, Maine.

SPONSOR CABLE SPLICING SCHOOL

A lead cable splicing school, under the joint sponsorship of the Electrical Contractors' Association of City of Chicago and Local B 134, IBEW, was recently concluded in Chicago. The student body of this experimental venture was composed of some 12 journeymen electricians employed by various contractors in the Chicago area. They were interested enough in learning the art of lead cable splicing to spend four hours per night, three nights per week for a period of approximately four weeks at the school. And at the end of the course they asked for more.

The school was held in the cable splicing classrooms and laboratory of the Illinois Bell Telephone Company where all the necessary equipment and facilities were made available to the men. Critical materials were conserved by using scrap pieces of lead cable and old lead solder that wasn't up to par for actual construction work. Three telephone company instructors, H. Hagg, Roy Avery and George Barrette gave the course which covered the theory and practice of making and wiping lead splices in horizontal and vertical, straight-through and branch runs.

running seams and the technique of preparing and using the lead solder. The major part of the course was devoted to practical work with each man splicing and wiping several joints under the critical eyes of the instructors. J. Walter Collins, secretary of the Contractors' Association and Harry J. Hughes, executive board member of the Local, organized the course.

WISCONSIN GETS EMERGENCY COMMITTEE

At a recent public hearing held before the Industrial Commission of Wisconsin, at Madison, it was voted to set up an Emergency Committee to handle electrical code changes relating to substitute materials and wiring methods. Known as the Emergency Committee for the Wisconsin State Electrical Code, it will hold meetings to review and take action on various Interim Amendments to the National Electrical Code.

CHICAGO'S BLACKOUT CAMPAIGN

Chicago is taking this war seriously. Although not considered as a theater of operations such as the coastal areas where dim-outs and blackouts are an accepted inconvenience, this midwest metropolis is a center of war industry and service training. It has had its practice blackout which proved highly successful. And it will have more in the future either of the pre-arranged or surprise type. To insure against slip-ups in the future, the City has made it mandatory that all lights visible from the outside be extinguished during a blackout. Violation of this rule carries a $200 fine or six months imprisonment. Particular attention is being paid to exterior building lighting, signs, store interiors and show windows. This means that some method must be provided to extinguish these lights from the store exterior.

Cooperating with the city officials and the O.C.D. in this campaign are the Commonwealth Edison Company, local utility, and the electrical contractors of the city. They have banded together to wage a store to store campaign to assist merchants in abiding by these regulations. The city has been divided into some 50 districts. Each district is assigned to a contractor and two Edison Company men who work with him in making the door-to-door canvass, after informing the local block captain of their plans. They explain the order to the store owner and tell him how exterior control of his store and window lights can be accomplished.

Edison engineers have developed a dozen blackout control methods which

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do not involve the use of critical materials. Contractors who have been in the field report that the jobs they have done range from $6 to $40 or more per store, depending on the complexity of the store lighting, the type of system installed and the equipment used.

To date 17 contractors are participating in the drive with 30 utility representatives covering about 15 districts in the city. When these have been thoroughly canvassed the utility men will cooperate with other contractors in the remaining districts. It is resolving into an all-out drive to help 60,000 merchants comply with Chicago's blackout regulations as effectively and economically as possible.

MOUNTAIN LEAGUE LOOKS TO POST-WAR ERA

The Rocky Mountain Electrical League, at its annual conference here October 16 and 17, dedicated itself to the job of helping contractors reestablish themselves during the post-war era. This phase of RMEL's program will become an important part of the League's Post-war Planning Committee, headed by A. L. Jones, General Electric Company's vice president and regional manager for the concern. George E. Lewis, League manager, announced that even those contractors who had been forced to close their shops and enter army munitions plants for the duration (due to inability to get wiring and other supplies) have maintained their memberships in RMEL.

While the meeting followed no set schedule, and was shorn of the usual festive diversions more business was transacted at the informal round-table discussions than at any previous convention. Electric utilities, distributors, manufacturers, contractors and dealers from Colorado, Wyoming and New Mexico were represented. The conference completed its transition from a promotional enterprise to a full-fledged War Agency, with many top men from government War Committees and commissions (electrical industry men, all) present. Gaylord B. Buck, vice president and general commercial manager of Public Service Company of Colorado will succeed J. W. Alexander, manager of the Rawlins Electric Company, Rawlins, Wyo. as president.

Alexander's genius, effecting the changeover of the League from peacetime to War enterprise, was recognized by the gift of an elaborate pen stand, and an ovation, from his associates. He will continue in office until the first of the year.

Four vice presidents were also elected: H. H. Lenhart, manager of the Cheyenne Light, Fuel and Power Co., Cheyenne, Wyo.; James A. Bullock, manager Western Colorado Power Co., Montrose, Colo.; E. A. Bradner, Las Vegas Light and Power Co., Las Vegas, New Mexico; and J. M. DePue, regional manager, General Electric Supply Corporation (representing the Manufacturers' and Distributors' division of RMEL). W. C. Sterne, president Arvada Electric Co., and Harry Adler, same firm, were elected treasurer and assistant treasurer, respectively. George E. Lewis was reelected secretary-manager.

PROCUREMENT TO AVOID LABOR SHORTAGE AREAS

War Production Board Chairman Donald M. Nelson has directed Government agencies which place war procurement contracts to avoid, wherever possible, contracting for the production of war materials in areas where acute labor shortages are known to exist.

The new directive also explicitly authorizes and directs war procurement agencies to pay higher prices, if necessary to comply with procurement policies set out in the directive.

Those policies require that in negotiating war procurement contracts, the following considerations shall govern in the order listed:

1. Primary emphasis must be placed on obtaining delivery or performance when required by the war program.
2. Contracts should be placed with concerns requiring the least new machinery, equipment or facilities to fill the contracts.
3. Communities or areas where acute labor shortages exist shall be avoided.
4. In general, contracts involving the more difficult war production problems should be placed with concerns best able, by reason of emergency, managerial and physical resource, to handle them. Contracts for items involving relatively simple production problems should be placed with concerns, normally the smaller ones, less able to handle the more difficult production problems.
5. All other things being equal, contracts should be placed so as to spread production among as many firms as is feasible.

MOTOR REPAIR problems in Moline, Ill., are solved by Alec Simko, president, Simko Electric Co. In addition to motor work, they make industrial fans.

AIRPORT LIGHTING USES HIGH VOLTAGE

The saving of more than 500,000 pounds of copper, steel, lead and other materials in the processing of a single project application was revealed by the War Production Board concerning a case of more than usual interest, involving $175,000 worth of wire and lighting equipment for Australian airports in the area of operations under General Douglas MacArthur. The application was made by the Lend-Lease Administration, and was supported by a cabled endorsement from General MacArthur.

The equipment requested involved the use of a low voltage, or multiple lighting system, which would have required 150,000 pounds of copper, 226,000 pounds of steel, and 380,000 pounds of lead. After examination of the application, the WPB Lighting Fixtures Section suggested use of the high-voltage system recommended by the Civil Aeronautics Administration for airports in this country.

The high-voltage system, officials explained, in no way affects the efficiency of the lighting and save 140,310 pounds of copper, 82,000 pounds of steel, and 280,000 pounds of lead.

Moreover, the change made by the Branch permits the use of equipment which is standard for street and other common lighting systems in this country, thus expediting delivery. The changes were approved by representatives of the Australian Government, the CAA, and the Lend-Lease Administration.

A high rating has been assigned by WPB to the project, and the equipment for the airports soon will be on its way "down under."

SHEPARD CHIEF OF SIMPLIFICATION BRANCH

Robert B. Shepard has been named Chief of the Simplification Branch, Conservation Division, WPB, according to an announcement Oct. 10 by Lessing J. Rosenwald, Director. Mr. Shepard, was advanced from Deputy Chief following the appointment of Howard Coonley, former Chief to the post of Deputy Director.

At the time of his appointment to WPB, Mr. Shepard was Chief Electrical Engineer of Underwriters' Laboratories, Inc.

EAST MOLINE Electric Company's capable president Edward Reavy, sees to it that the electrical needs of East Moline, Ill., are well taken care of.

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TRUCK RULES ISSUED BY ODT

Two sets of instructions to operators of commercial motor vehicles have been issued by the Office of Defense Transportation to aid in filing applications for Certificates of War Necessity under General Order ODT No. 21. One set is directed to operators of one or two vehicles, the other for fleet operators.

Copies of the booklet describing the order, required inspections and methods of filing application blanks may be obtained from ODT offices.

SECOND-HAND MACHINE DEALERS LICENSED

Automatic licensing of all dealers selling used machine tools or extras or second-hand machines or parts has been announced by the Office of Price Administration.

Supplementary Order No. 20 which was effective September 26, 1942, also requires every second-hand machine tool or second-hand machinery dealer to register with the Office of Price Administration, Washington, D. C., on or before November 2, 1942, by filling out OPA Form No. S020:3. This form is obtainable at the Washington office of OPA or at any OPA regional State or district office.

A dealer's license may be suspended if he violates any provision of Supplementary Order No. 20 or any price schedule or regulation covering such machine tools and machinery. The dealer thereupon loses his privilege to do business.

OPA's experience has indicated that licensing of dealers is necessary for effective control of dealings in used machine tools and machinery. "It has been deemed necessary to issue Supplementary Order No. 20 because of the vital role that used machinery plays in the war program," OPA said.

Maximum prices for second-hand machine tools or extras are established in Revised Price Schedule No. 1 (Second-Hand Machine Tools). Those for machines and parts are provided in Maximum Price Regulation No. 136 as Amended (Machine and Parts and Machinery Services).

Ceiling prices for used machine tools range from 50 to 95 per cent of the prices of equivalent new machine tools, according to age and condition. For the used machines and parts covered by Maximum Price Regulation No. 136 as amended, a maximum price of 85 per cent of the maximum price of the nearest equivalent new machine or part is permitted for a rebuilt and guaranteed machine, and 55 per cent if the machine is sold on an "as is" basis.

Supplementary Order No. 20 does not apply to retail sales of second-hand machine tools or extras, or second-hand machines or parts.

OPA COUNSEL APPLIES MPR 136 TO CONTRACTORS

In a letter dated October 2nd, addressed to the Henderson-Hazel Corporation, publishers of the National Price Service for electrical contractors, Harold Leventhal, Assistant General Counsel for OPA, has advised that electrical contractors are subject to the provisions of Maximum Price Regulation No. 136 as amended, Machinery and Machinery Parts, and Machinery Services. His interpretation is as follows:

"Proceeding to the status of electrical contractors under Maximum Price Regulation No. 136, as amended, we hereby advise you that:

1. Sales of equipment or material mentioned in Appendix A or B, sections 1390.32 and 1390.33 of Maximum Price Regulation No. 136 made by the contractor at a retail price to an ultimate consumer, whether made in or outside his shop or place of business, are excluded from the Regulation.

2. Sales of material or equipment covered by the Regulation when made by the contractor to an industrial, commercial or governmental user, whether made in or outside of his shop or place of business, are covered by the Regulation, unless such sales involve items usually sold to private consumers, such as householders, and are made at the retail prices which would be used in making sales to that class of purchasers.

3. The Regulation applies to such sales of material and equipment which it covers as may be involved in the contractor's contract work, where the contract is on the basis of: (a) material, labor, and services or (b) time and material, or (c) any other basis where payment is separately made for material or equipment, except (d) a true "cost-plus" basis, which includes only these contracts in which a flat fee or percentage is added to actual costs, i.e. costs which include no element of profit, or margin of overhead, or other markup or addition.

4. Strict cost-plus contracts, as explained above, are excluded from Maximum Price Regulation No. 136 but the contractor entering into such a contract involving sales of equipment or material covered by the Regulation must file a report thereof under Section 1390.14 of the Regulation.

5. Compensation which the contractor receives for his services only in making installations of material and equipment covered by the Regulation are specifically excluded from the Regulation by section 1390.10 (f) and, at present, compensation for such services is controlled by the General Maximum Price Regulation except for that portion covered by Maximum Price Regulation No. 165, which touches the contractor's services principally as they relate to repair and maintenance of household, retail establishment and institutional equipment. Separable sales of covered material and equipment which the contractor may install are included in the coverage of Maximum Price Regulation No. 136.

6. The contractor's work in the way of repair, rebuilding, maintaining or performing any of the other acts defined as "machinery services" by the Regulation,

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upon any material or equipment covered by the Regulation are, of course, included in the Regulation as are any other such machinery services.

7. Insofar as the contractor's sales of material may include wire, cable and cable accessories, as defined by Revised Price Schedule No. 82, such sales are covered by that Schedule. Issuance of Amendment No. 2 to Schedule No. 82 on September 3, 1942, retroactive to July 22, 1942, took resellers of wire, cable and cable accessories from under the coverage of Maximum Price Regulation No. 136 and put them under Revised Price Schedule No. 82. The base date for determination of prices under Schedule No. 82 is October 15, 1942.

We trust that the foregoing information will serve in some measure to clarify the position of the electrical contractor under Maximum Price Regulation No. 136. Due to the fact that the electrical contractor exercises so many functions by such diverse methods other questions will no doubt arise. If you will advise us of these problems, we will endeavor to see that they are solved as promptly as is reasonably possible."

Through an interpretation of MPR 136 supported by the Cleveland District OPA office, the Henderson-Hazel Corp. advised its clients months ago to file price lists in accordance with the provisions of that regulation. Until this letter was received, however, no written interpretation has been available from Washington defining the status of the electrical contractors under MPR 136.

(Editor's Note: No general release to the press from OPA has come to our attention concerning the above interpretation as we close this issue. A new regulation is in preparation covering construction and maintenance.)

WAR CONSTRUCTION SCALED DOWN

The volume of all building and engineering construction—exclusive of shipbuilding—scheduled for the war program in 1943 will drop by more than a third, it was estimated by the War Production Board.

At the present rate such war construction alone will reach a total of more than 11 billion dollars at the end of 1942, topping the previous all-time record for all types of construction established in 1927 with a figure slightly less than 11 billion dollars.

An estimate of next year's construction total was made in a telegram sent by Stacy May, Director of the Statistic Division, WPB, to the annual meeting in Colorado Springs, Colorado, of the American Institute of Steel Construction.

"It is expected that the volume of all building and engineering construction, exclusive of shipbuilding, scheduled for the war program in 1943 will drop by more than a third. Because of this reduction in

the volume of construction and because of the use of methods which economize on steel, it is expected that the volume of fabricated structural steel which will be required for building and engineering construction, exclusive of shipbuilding, in 1943 will be substantially less than what has been used this year, and will amount to not over a million and a quarter tons. A larger proportion of this volume than heretofore will, moreover, probably comprise miscellaneous items of a special character rather than the normal structural steel for buildings.

CODE SUPPLEMENT ISSUED

The Supplement to the 1940 Edition of the National Electrical Code has been released and is now available from the National Board of Fire Underwriters. The practice of issuing a new edition of the Code has been discontinued for the duration of the war emergency. The 1940 edition remains in effect with such amendments in effect as may be necessary to meet emergency conditions.

The Electrical Committee of the National Fire Protection Association, through unanimous action, which has been approved by the Board of Directors of the Association, has created an Emergency Committee of the Electrical Committee. This Emergency Committee has power to take such action as may be warranted by the present emergency, and to publish it in the name of the Electrical Committee; this Interim action will remain in effect until the next following meeting of the Electrical Committee.

The Supplement contains all Interim Amendments to the 1940 edition of the code which have been approved by action of the Electrical Committee or by the Emergency Committee up to the date of Sept. 1942. These are recommended for application in the administration of the National Electrical Code.

The Supplement also contains all Interpretations to the 1940 edition of the National Electrical Code that have been approved in accordance with the established procedure of the Electrical Committee up to the date of issue.

The Interim Amendments and the Official Interpretations are arranged in order of the code sections to which they refer. Indexes of both the Interim Amendments and the Interpretations, in both section reference number and serial number are also included.

Interim Amendments are to remain effective only during the war emergency.

COPPER SUPPLY UP

Every pound of copper available currently is going into direct military orders, shipments to our allies or into the most essential industrial uses bearing preference ratings of A-1-a or higher, H. O. King, Chief of the Copper Branch disclosed last month.

Current copper supply in excess of

200,000 tons per month, is the largest in the country's history. Domestic mine and smelter production is larger than ever before, imports exceed any previous year, and scrap collections are at a new high. Approximately 31 per cent of this year's total copper supply will come from old and reprocessed mill scrap.

The extreme tightness of the copper situation is demonstrated by the fact that copper currently used for domestic electric systems, communications, industrial motors and fittings, chemical plants and all of the thousands of industrial and essential civilian purposes which must be met is much less than one-fifth of our total supply. Copper scarcity is further reflected by the recent announcement of the Copper Branch that even brass and wire mills and foundries would be allotted no copper of any kind including scrap, except on preference ratings of A-1-a and higher. The estimated 1942 U. S. copper supply totals 2,571,700 tons including imports and scrap.

Some non-military uses of copper are essential and must be continued. Light and power for industry and housing must be provided, communications must be maintained, and a few other uses without which our society could not operate are being taken care of in a limited way.

Priorities

HAND TOOLS TO A-9 OR HIGHER

Sales and deliveries of hand service tools by manufacturers are limited to purchase orders rated A-9 or higher in an amendment (No. 2) to General Preference Order E-6, issued today by the War Production Board. Tools covered by the order include chisels, hammers, industrial hand files, pliers, punches, screwdrivers, snips and wrenches.

In the original order, sales and deliveries of hand service tools by manufacturers on purchase orders rated as low as A-10 were permitted.

NEW "CONVERSION" FORMS AVAILABLE

A revised project application form PD-200, which is to be used for obtaining priority assistance and authority to begin construction for most construction items and equipment, is now available for use, the WPB announced September 14.

This form must now be used as an application for—1) Authority to begin construction pursuant to the provisions of the

Stop-Construction Order L-41. 2) Priority assistance for any project involving new construction, reconstruction, remodeling, or conversion. 3) Priority assistance for equipment when construction is involved. PD-1A applications formerly submitted for such equipment will no longer be accepted. When no construction is involved, however, PD-1A's will continue to be accepted for equipment.

This revised PD-200 form does not replace PD-105, used for privately financed war housing, or PD-406, used for remodeling houses in critical defense areas. Neither does it replace form PD-3A, used for projects owned by the armed services and identified as "command" construction.

BUSINESSMEN URGED TO CONSULT LOCAL WPB OFFICES

The War Production Board urged businessmen that whenever they wish to obtain information from WPB they should go to their regional or field offices before coming to Washington.

"We have 12 regional and 127 field offices scattered throughout the country," the announcement said. "They were established in order to save businessmen the trouble of coming to Washington, and also to prevent an overload of work in Washington.

"When a businessman comes to Washington instead of going to his regional or field office he not only undergoes considerable expense and inconvenience himself, but also increases the burden on the men in Washington. Furthermore, the businessman can usually get quicker action in the field."

REQUEST FOR BLACKOUT MATERIALS TO BE REVIEWED

To insure maximum protection against air raids for the plants whose production is most important to the war effort, the War Production Board announced that requests for the use of critical materials to be used in protective devices hereafter will be granted only after consultation with WPB's Resources Protection Board.

The Resources Protection Board consists of representatives of the War Department, Navy Department, Office of Civilian Defense and War Production Board.

This decision was reached in the face of an increased nationwide demand for blackout ventilating equipment, dim-out lighting fixtures, alarm systems, fire extinguishing equipment, steel fences, camouflage paint and other items using critical materials.

WPB stated that this demand has grown to huge proportions and cannot possibly be met without diverting quantities of steel, brass, copper and other important metals from direct war uses which are more immediately urgent. The possibility of occasional bombings cannot be allowed to curtail unnecessarily the flow of critical materials to plants now making vital military items. However, it is important to achieve a maximum of protection where this does not interfere with the need for

In the News

[FROM PAGE 117]

critical materials. Consequently, owners and operators should make every effort to install protective equipment which does not involve such materials.

The WPB, therefore, has issued instructions that preference ratings be denied for critical material or equipment which is intended for protection purposes except in special cases and then only after consultation with the Resources Protection Board.

The Resources Protection Board, under the chairmanship of William K. Frank, is making an over-all study of the relative importance to the war effort of all plants, installations, communications networks, mines and natural resources. After determining the importance of facilities the Board applies comparative ratings for the nation as a whole.

UTILITY MAINTENANCE MATERIALS CURBED

The amount of scarce metals that public utilities may use for maintenance and repair of transmission and distribution systems during the last quarter of 1942 is out approximately 40 per cent under Order P-46 as amended. A reduction of the same percentage has also been made in permissible inventories.

Previously a utility could use as much scarce metal for maintenance, repair and for small construction jobs as it used during a corresponding quarter in 1940. Under the amended order this amount is cut to a percentage of the base period, the reduction amounting to approximately 40 per cent.

The metals affected are chiefly copper and steel, and the cut is possible largely because all non-essential utility maintenance and construction has been halted.

All ratings assigned by the order for materials required for maintenance and repair have been raised from A-2 to AA-5, with a rating of AA-2 for emergency repairs.

HIGH RATINGS FOR EMERGENCY

In a move to prevent stoppages or slowdowns in essential production that might arise from lack of small amounts of critical materials, the War Production Board has authorized its regional offices to assign high preference ratings for the use of earmarked materials in emergency situations.

Under this regional emergency materials plan, preference ratings up to AAA to avoid positive losses of essential production and up to AA-2X for other emergency cases may be assigned.

The quantities of materials against which such preference ratings in the aggregate may be assigned each month are not to exceed a small specified percentage of the available supply of each material.

RULES FOR FIELD RATINGS GIVEN

Methods to be followed by WPB field officers in the assignment of preference ratings to military and other government orders were outlined in an announcement of Priorities Directive No. 2 by the Director General for Operations.

Recommendations for ratings will continue to be initiated by the procurement officers. The directive provides interim methods for approval of ratings assigned to individual contracts on Form PD-3A, to construction projects on forms in the P-19-h series, and of re-rating directions on Form PD-4X, pending establishment of a complete system of review by revision of administrative orders and instructions.

Following counter-signature by the appropriate service officer, WPB will check ratings assigned to see that they are in compliance with military priorities directives and instructions of the Army and Navy Munitions Board and with WPB regulations, administrative orders and instructions. In case of disagreement as to interpretation, the question will be reviewed as the Director General for Operations may direct. In disputed cases, the decision of the Deputy Director General for Priorities Control will be final.

Excepted from the above are ratings assigned in the following circumstances:

(a) When the total value of the delivery or deliveries rated by the instrument does not exceed $500. Purchases shall not be divided for the purpose of making this exception available.

(b) When the countersigning by an Army or Navy officer takes place outside of the forty-eight states and the District of Columbia.

(c) When the rating is assigned directly to a purchase made by a Post Exchange or Ship's Service Store.

(d) A purchase made pursuant to approval given by a commanding officer, commandant, or the Bureau of Supplies and Accounts of the Navy, or by a commanding officer of a defense command of the Army, in an emergency where the degree of urgency is such that advance approval by a War Production Board official cannot be obtained.

JOHN H. OLDS, president, Olds Electric Co., Davenport, Ia., contractor, is keeping his men hopping these days at the Savannah, Ill. proving grounds.

In the News

[FROM PAGE 119]

(e) In such other cases as may be excepted, either individually or by classes, by or under written authority of the Director General for Operations.

Military construction, defined as the construction of facilities which will be owned and operated for the Army, Navy or Maritime Commission, and airport and other aircraft facilities to be built or owned by the Civil Aeronautics Authority for the use of the Army or Navy, is to be rated by an order in the P-19-h series, following application on a form in the PD-200 series. The application will be countersigned by the Army and Navy Munitions Board and must be approved in writing by an authorized official of WPB before issuance. All construction other than military construction will be rated only by WPB.

Excepted from the above is "command construction" ordered by the Chief of Staff, United States Army, or the Chief of Operations, United States Navy, to be built under contract let by the Corps of Engineers or the Bureau of Yards and Docks including construction of facilities for the repair or manufacture of finished items of munitions, having a value of less than $500,000, and emergency flood control projects costing less than $100,000. Such construction will be rated by procurement officers on Form PD-3A and the ratings approved by WPB.

—WITH THE— *Manufacturers*

Mitchell Manufacturing Company, Chicago, has appointed Edwin A. Nickel as sales manager. He will continue to handle advertising.

•

The Allis-Chalmers Manufacturing Co., Milwaukee, has appointed Selden H. Gorham as manager of dealer sales. For the past six years Mr. Gorham has been in charge of sales and production for the feed water treating department.

•

The Independent Pneumatic Tool Company, Chicago, announces the appointment of Vance G. Turner as manager of the Boston branch office. The Boston branch has moved to new offices at 78 Brookline Avenue and the Birmingham, Ala., office has moved into its new home at 1411 North Third Avenue.

Westinghouse Changes

Westinghouse Lamp Division, Bloomfield, has set up a new illuminating engineering department, to plan for post-war as well as present-day expansion in the use of fluorescent, mercury, vapor and other light sources. D. W. Atwater has been appointed manager of this department.

Ralph R. Brady has been named manager of the commercial engineering department to succeed Mr. Atwater.

G. E. Appointments

The General Electric Co. has transferred Henry J. Chanon, a lighting engineer, from its Nela Park headquarters to the Company's South Pacific Division in Los Angeles. Mr. Chanon, in his new work, will specialize in the design of lighting systems for aircraft industries, in ship building and wartime motion picture production work. He will also serve as consultant for blackout of coastal areas in Southern California.

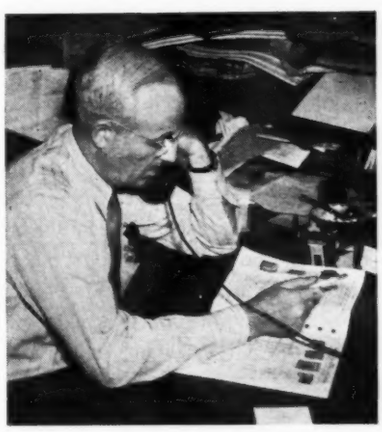
J. O. Wetherbie has been appointed manager of General Electric wiring materials district No. 2, with headquarters at 570 Lexington Avenue, New York. In his new assignment Mr. Wetherbie will have charge of G.E. wiring materials sales along the Atlantic seaboard from New York City to Charlotte, N. C.

More Gossip

Underwriters' Men in Service

Two electrical engineers of the New York office of the Underwriters' Laboratories, Inc., have recently joined the United States Armed Services.

Duncan B. Anderson, who headed the section testing heating appliances, and radio receivers, is now a first lieutenant in the army ordnance department.



ENGINEER L. W. Zeug of Leithner & Weishar, Rock Island, Ill., electrical contractors, tries to scout some explosion proof equipment for one of the many war plant jobs he is handling.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : "OPPORTUNITIES" : EQUIPMENT BUSINESS : : (Used or Resale)

UNDISPLAYED —RATES— DISPLAYED

15 CENTS A WORD. MINIMUM CHARGE $3.00 *Positions Wanted* (full or part time salaried employment only), ½ the above rates payable in advance. *Box Numbers*—Care of publication New York, Chicago or San Francisco offices as 10 words. *Discount* of 10% if full payment is made in advance for 4 consecutive insertions.

The advertising rate is $7.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

Individual Spaces with border rules for prominent display of advertisements.

NEW ADVERTISEMENTS received by November 18th will appear in the December issue, subject to limitations of space available.

POSITION VACANT

ELECTRIC MANUFACTURER would like to engage services of an engineer qualified to design and estimate panelboards, switching enclosures, switches, and sheet metal products of a type now being procured by Army and Navy. Address P-37, Electrical Contracting, 330 W. 42nd St., New York, N. Y.

POSITION WANTED

ARMATURE WINDERS WANTED, Conlan Electric Corporation, 1039 Pacific Street, Brooklyn, New York.

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Electrical Contracting, published monthly at Albany, N. Y., for October 1, 1942.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. A. Gerardi, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electrical Contracting, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42nd St., N. Y. C. Editor, None. Managing Editor, W. T. Stuart, 330 West 42nd St., N. Y. C. Business Manager, M. S. MacNaught, 330 West 42nd St., N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder, the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) McGraw-Hill Publishing Company, Inc., 330 West 42nd St., N. Y. C. Stockholders of which are: James H. McGraw, 330 West 42nd St., N. Y. C. James H. McGraw, Jr., 330 West 42nd St., N. Y. C. James H. McGraw, James H. McGraw, Jr., and Curtis W. McGraw, Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw, 330 West 42nd St., N. Y. C. Curtis W. McGraw, 330 West 42nd St., N. Y. C. Donald C. McGraw, 330 West 42nd St., N. Y. C. Anne Hugus Britton, 330 West 42nd St., N. Y. C. Mildred W. McGraw, Madison, N. J. Grace W. Mehren, 73 No. Country Club Drive, Phoenix, Ariz. J. Malcolm Muir & Guaranty Trust Co. of New York, Trustees for Lida Kelly Muir, 140 Broadway, N. Y. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is. (This information is required from daily publications only.)

J. A. GERARDI, Secretary.
McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 29th day of September, 1942.

[SEAL] CHESTER W. DIBBLE.

Notary Public, Queens County. Queens County Clerk's No. 4166. Certificate filed in N. Y. Co. Clerk's No. 889.

(My commission expires March 30, 1943)

More Gossip

Conserving Fuel Oil

The M. J. Torrance Electrical Supplies Co., Inc., Rock Island, Ill., motor service shop has worked out a system of combating the fuel oil shortage this winter. They have perfected a method of filtering used transformer oil so it can be burned in their heating plant. Oil that, after filtering, does not come up to test for further electrical use, if put through another filtering process to remove the paraffin so it can be used in the oil burner.

Tests have proved that the idea is practical and the motor shop is now completing the necessary equipment to assure a steady flow of re-filtered oil to the heating plant.

Sherry Wins Inspector Post

Allen W. Sherry, for many years a city employee as a specialist on fire and police alarm boxes, was recently appointed to the position of Inspector of Wires by the City Council of Lynn, Massachusetts. Mr. Sherry fills the vacancy caused by the death of Thomas H. Carritte, who headed this department for many years.

Green Bay Scrap Drive

The Green Bay Electrical Contractors' Association, Green Bay, Wis., recently sponsored a one-week scrap collection campaign which unearthed between eight and nine tons of metal which will eventually be dished out to the Axis in highly indigestable doses. A. A. Allen, city electrical inspector, was chairman of the drive.

Others working with Mr. Allen included L. P. LaHaye, Al DeGroot, V. E. Grebel, A. A. Bodart, C. L. Kehl, H. M. Beemster, G. W. Knoeller and J. C. Bertrand.

MANAGER Harold W. Pedersen, Industrial Engineering Equipment, Inc., Davenport, Ia., heads an imposing list of electrical and mechanical engineers who specialize in the repair and application of motors, controls and drives.

H. M. HEYSINGER, president, Davenport, Electric Contract Co., Davenport, Iowa, values engineering as a contractor's tool. Simplified, detailed sketches save time and speed the construction job.

Still Going Strong

The Red Seal Adequately Wired Home campaign in Kansas City, Mo., is still very much on the up-swing, setting a 16 year record. During July, 71 homes were certified making a total of 704 to August 1, as against 321 for the same period last year—a 119 per cent increase.

So far this year, 74 per cent of all new homes over $3000 in price have been certified. And the average number of electrical outlets per certified home is 58—a fine record for low-prices houses.

Helps Make Ammunition

The machine shops of motor repair organizations are not always busy, working only when a repair job requires certain types of machine work. Like many other shops, Industrial Engineering Equipment, Inc., Davenport, Iowa, has turned its machine shop department over to war production. Instead of being idle most of the time, this department is now making punches that are used by other manufacturers for punching out small arms ammunition.

***MULTIPLE DUTIES** fall on the capable shoulders of H. P. Wilson, secretary-manager, Electric Institute of the Tri-Cities, Rock Island, Ill., and secretary-treasurer of the Quad Cities Electrical Contractors Association covering East Moline, Moline and Rock Island, Ill., and Davenport, Ia.*

More Gossip

Contractors Now "Demolition Workers"

Twenty-eight electrical contractors have been graduated from a special 8-weeks training class in Civilian Defense which has given Electric League of Indianapolis members a basic instruction in the handling of "Bombs" and "Wreckage". This is the first instance in Indianapolis in which any particular industry group has been selected for such special service and enrolled through their own organization.

These men, all of whom have been duly certified and assigned to various zones, will now stand by to serve their community in the event of an air raid or possible sabotage.

Piscatorial Perfection

A. L. Racke, electrical contractor of Persimmon Grove, Kentucky, showed that he had the knack of blending just the right portions of business and pleasure when he recently entertained the Electrical Contractors Division of the Cincinnati Electrical Association at his home. After the business session was over, he exhibited movies of his recent fishing expeditions—a show the anglers really enjoyed. And to top off a perfect evening he provided them with huge quantities of fried fish and refreshments. The guests returned home with a fish story that really rang true.

Boston Motor Shop Triples Space

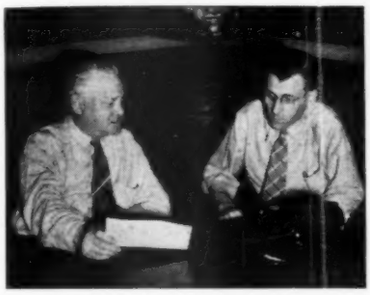
J. J. Reddington Electric Service Co., motor repair and contracting organization of Boston, Mass., recently acquired its own building at 20 Bluehill Ave., Boston. The new quarters provide Jack Reddington and his company with 10,000 square feet of floor space on one floor—about three times the floor space at the old 1228 Massachusetts Ave. address. Jack now has the additional elbow room needed to carry on his expanded business.

***SELLING SERVICE** is one of the specialities of Harry M. Carmichael, Carmichael Electric Co., Davenport, Ia. If a customer wants a fixture, Harry will sell him fixture plus installation.*

Back From The Scrap Pile

The emergencies of wartime make way for the reclamation of a number of dead indians amongst the machinery and motor clan. M. J. Torrance Electrical Supplies Co., Inc., Rock Island, Ill., motor service shop, are the surgeons who are injecting life into some 100 crane motors which, at the turn of their 35th birthday were slowly awaiting death on the scrap pile. And the job wasn't easy, for these 25 hp. motors had had their dunkings in the muddy waters of the Mississippi during previous floods.

Renewal parts were unobtainable. But that didn't faze the Torrance crew. They machined the new parts in their shop and had the old and long considered obsolete motors humming in short order. Now they are back on the job again, helping to keep the war plants operating at full capacity.



EXECUTIVE CONFERENCE evolves as (L to R) M. J. Torrance, president, and R. F. Hoorebeke, general manager, M. J. Torrance Electrical Supplies Co., Inc., Rock Island, Ill., talk things over. Being the largest motor repair shop in the city, they have their hands full rehabilitating electrical equipment for their industrial customers.

More Joint Ventures

Joint ventures between electrical contractors on war plant work continue in the mid-west. Harry Evans of Kansas City, Mo., is increasing his list of joint venture enterprises by teaming up with Hatzel & Buehler, Inc., of New York City to handle the electrical contract for the large Pratt & Whitney airplane engine plant in that area.

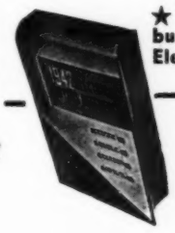
In Chicago, three of the city's largest electrical contractors have pooled their resources in a joint venture to handle the electrical work at the new Chrysler aviation engine plant now under construction. The firms are Dearborn Electrical Construction Co.; J. Livingston & Co., and White City Electric Company. The electrical field organization is headed up by Robert McCaw as project manager with Samuel Stoler as assistant manager. Glen Shutts is chief electrical engineer and Arthur O'Hara, superintendent. Leo Mayer is purchasing agent.

The architect's plans call for 78 acres under roof and when completed the plant will be larger than Ford's Willow Run production giant. At peak construction, the electrical contractors expect to employ about 2,000 electricians on the job.

Alphabetical Index to Advertisers

November, 1942

★ These companies have included Briefalogs, containing additional buying information on their products, in the 1942 edition of the Electrical Buyers' Reference.



IAEI Sections Review Code Supplement

Five regional meetings of electrical inspectors discuss wartime changes in wiring methods, inspector's problems and Code rules

CIRCUIT RIDERS, *President Gaffney and Secretary Tousley addressed all Section meetings, helped to correlate discussion.*

WESTERN SECTION *greeters who welcomed delegates to busy Detroit are Herbert E. Cook and Chairman James Galbraith.*

RESOLUTIONS *presented to the Eastern Section are edited by committeemen William E. Armstrong and C. A. Berlepsch.*

IN a series of meetings at Portland, Fresno, Detroit, New Haven and Richmond from September 17 to October 21, the Sections of the International Association of Electrical Inspectors analyzed the problems that war has brought to the electrical industry and to the electrical inspector. A total of approximately 1,500 men from all branches of the industry took part in the five meetings; electrical inspectors from municipal offices, insurance rating organizations, electric utilities, electrical contractors, representatives of electrical manufacturers, and electrical men from government and industry gathered to review their common interest in the National Electrical Code and its interpretation and enforcement.

Wartime restrictions on wiring materials, substitutes for the usual methods and materials, newly developed techniques for handling war production load formed the concentrated program of the Portland, Oregon, meeting. The Northwestern Section meeting was streamlined to two days, Sept. 17-18, and began the series.

Beside consideration of the interim amendments to the National Electrical Code and reports of article committees on proposed Code changes, the Northwestern group heard talks on aircooled transformers, type S fuses, emergency alternate specifications applied to substitute electrical material, protective lighting, civilian defense and blackouts. W. L. Gaffney of Tacoma presided.

The Southwestern Section program placed special emphasis upon war conditions. Clifford Prud'homme, Sacramento, president of the Section presided. Beside the Code changes and similar discussions, papers were presented on factory network systems, threading of electric metallic tubing, application of busways in war production plants, the effect of priority orders on utility operations and home installations, labor's part in the war production, black light, use of porcelain wiring devices, blackouts and dimouts, and the uniform electrical code.

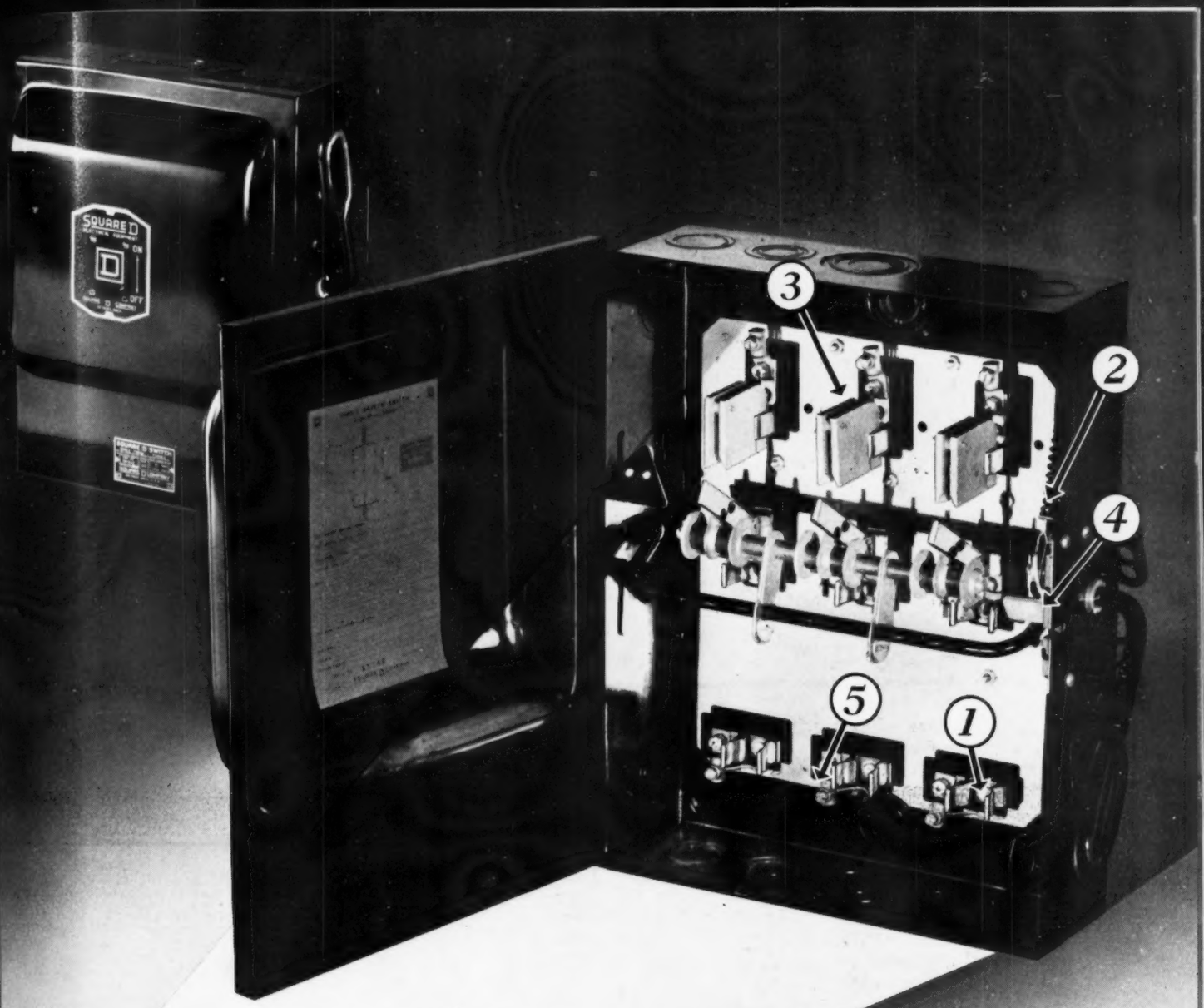
The Western Section meeting held in Detroit, Michigan, October 5 to 7, heard a series of addresses and reports bearing on substitute materials, network distribution systems, civil defense problems, and priorities and code changes. D. J. Talbot, Western Section president, Chicago, presided. A symposium on the effects of the war on various branches of the electrical industry was conducted by a representative panel including F. M. Hydon, President of the Detroit Chapter of the National Electrical Contractors Association, Detroit; Donald M. Mackie, Commonwealth and Southern Corp., Jackson, Michigan; D. L. Fife, President of the National Electrical Wholesalers Association, Detroit; M. H. Hedges, Director of Research, International Brotherhood of Electrical Workers, Washington; H. H. Weber, Commercial Engineer, U. S. Rubber Co., and Arthur H. Welklin, City Electrical Inspector, Ft. Wayne, Indiana.

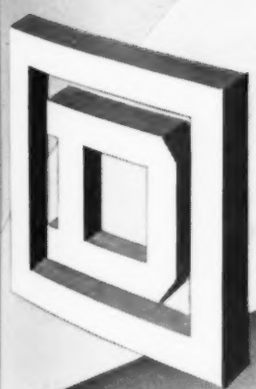
The Southern Section meeting in Richmond, Va., October 19 to 21, reviewed some of the urgent inspection problems brought about by the rapid wartime expansion of industry.

International President W. L. Gaffney of Tacoma, Wash., addressing each of the meetings, called attention to the great moral and legal responsibility that inspectors must assume in war to protect the home front against electrical hazards. He urged a reduction in permissible wiring systems and types of wire in the interest of standardization.

V. H. Tousley, International Secretary, discussed the establishment of the Emergency Committee and its activities. Electrical inspection personnel is reduced, he stated, by transfer to war industries.

"While we must and are assuring that substitutes are the safest available, the new Code Amendments and substitutes will increase electrical hazards," he continued, advising the drafting of every available electrical inspector to the job of safeguarding important war industry plants, by a comprehensive plan of continuing inspection.





FOR HEAVY AND CONTINUOUS DUTY— SQUARE D SAFETY SWITCHES

1 **Positive Pressure Fuse Clips** reduce heating at the contact by more than 60 per cent. Steel reinforcing springs provide long contact life and positive automatic gripping of the fuse.

2 **Compression Spring** provides quick make and break. Long life is ensured because it is operated in compression only. Spring gives switch a high breaking speed which prevents burning of contacts.

3 **Square D Arc Suppressors** on switches above 250 volts, greatly minimize the arc by cooling and confining it and increase the rupturing capacity by more than 500 per cent. Square D switches equipped with Arc Suppressors rupture the current in 1/100 of a second, even at low power factor.

4 **Interlock Mechanism** has few operating parts and is compact, affording ample wiring space on both sides of switch. It prevents the switch door being opened when switch is "ON" or operating switch when door is open. Authorized inspection of switch can be made by means of a key.

5 **Solder-Solderless Connectors** may be used either as solderless connectors or as solder lugs. Each connector covers a wide range of wire sizes and has only two parts—a cast lug and a special brass setscrew. Approved by Underwriters' Laboratories, Inc.

Call in a **SQUARE D** *man*

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO